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The New  
UNIVERSAL  
Encyclopedia



**Volume 4**



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*Specially painted for the New Universal by Stephen Bone*

**K**ING'S COLLEGE, CAMBRIDGE, was founded in 1441 by Henry VI, and five years later he laid the first stone of its great chapel. This magnificent building, which took one hundred years to complete, has become one of England's most cherished architectural treasures.

# The New UNIVERSAL Encyclopedia

*Edited by*

**Sir John Hammerton**

*Editor of The Universal History of the World,  
The Second Great War, etc.*

**VOLUME FOUR**

*pages 2637 to 3504*

**DELL-FOYN**



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**Dell, ETHEL M.** (d. 1939). A British novelist. She gained her first success with *The Way of an Eagle*, 1912. Specialising in the aristocratic "strong silent hero," her novels were full of romantic improbabilities, and appealed to a wide public. Her best-sellers included *The Knave of Diamonds*, 1913; *The Rocks of Valpré*, 1914; *Great Heart*, 1918; *Storm Drift*, 1930; *The Prison Wall*, 1932. She died Sept. 17, 1939.

**Della Cruscan School.** Name given to a small clique of 18th century British poetasters who wrote verses marked by insipid sentiment; employed extravagant conceits; and adopted a bombastic classicism. The chief figure of the group was Robert Merry (1755-98), who styled himself a new Petrarch and took the name of Della Crusca after the Accademia della Crusca (*q.v.*) at Florence, where he was the soul of a literary salon. The clique included Hannah Cowley (Anna Matilda), Edward Jerningham (The Bard), Mary Darby (Perdita), and others, and their verses appeared in two London daily papers, *The World* and *The Oracle*, in which they were heralded as poets of genius. The school was finally crushed by the publication of two satires, *The Baviad*, 1794, and *The Maeviad*, 1795, by William Gifford (*q.v.*).

**Della Robbia, ANDREA** (1435-1523). Florentine sculptor. The nephew of Luca della Robbia, he learned his art in the workshop of his uncle. Soon he began to execute reliefs himself, and some are among the most remarkable of their kind. He made them for secular as well as for religious uses, and in some ways effected improvements in his uncle's methods and designs. The foundling hospital at Florence has some fine examples and there are others at Arezzo and Prato. Andrea had seven sons, of whom five followed his calling. Two, inspired by Savonarola, left it for the monastic life. The other three, Luca (b. 1475), Giovanni (1469-1529), and

# Volume 4

Girolamo (1488-1566), have all left fine examples of their art. Girolamo also built a palace in Paris for the king of France, but this no longer exists. See *Bambino illus.*

**Della Robbia, LUCA** (1399-1482). A Florentine sculptor. He was probably a pupil of Lorenzo



Luca della Robbia,  
Florentine sculptor  
After Vasari

Ghiberti. His finest achievement was the marble reliefs of the Cantoria or singing gallery executed for the cathedral of Florence, 1431-40, part of which is still preserved in the Museo del Duomo, and he was associated with Donatello in other work for the cathedral. Sculpture in enamelled terra-cotta was brought to a high state of perfection by him. Luca died in Florence, Feb. 20, 1482. Specimens of his work are in the Victoria and Albert Museum, London, including twelve plaques in blue on a cloudy white ground, depicting the cycles of the months; but the largest number is in the National Museum at Florence.

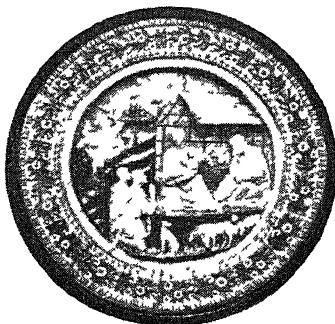
**Della Robbia Ware.** Terra-cotta figures and relief sculptures covered with a brilliant stanniferous glaze. At first this glaze was colourless, but Luca della Robbia, who developed the process to such perfection that it became known by his name, added oxide to give colour. Typical

Della Robbia ware has a blue background; the designs are classic in style, finely and boldly modelled. Luca and his partners were prolific producers and their successors continued to work until 1568, when the secret was lost. See *Terra-cotta.*

**Deller, SIR EDWIN** (1883-1936). British educationist. Born at Paignton, he began his administrative career at 19 in the office of the Kent education committee, combining with his daily work the study of law at London university. In 1912 he became a secretary in the academic department of the university, and assistant secretary of the Royal Society in 1920. Returning to the university in 1921 as academic registrar, he became principal in 1929, a position he retained until he died on Nov. 27, 1936, as the result of an accident while inspecting work in progress on the new buildings, a development he had done much to promote. Deller received a knighthood in 1935.

**Dellys.** Seaport and military post of Algeria, 50 m. by rly. E. of Algiers. It has a good roadstead, and the town is divided into a new European quarter with fine buildings and streets, and an old Arab quarter with squalid houses and narrow lanes. There is a trade in olives and wine. Pop. 18,864.

**Delmenhorst.** Town of Germany, in Oldenburg. It stands on the Delme, 7 m. W. of Bremen, and its industries are connected with the manufacture of linoleum, cigars, bricks, iron ware, and the



Della Robbia Ware. Terra-cotta enamelled relief, representing the Nativity and Annunciation to the Shepherds. This relief dates from c. 1430, but the border of roses is probably a later addition  
Victoria & Albert Museum

preparing of wool and jute. It has Roman Catholic and Protestant churches. Units of the 51st (Highland) division captured Delmenhorst on April 20, 1945, during the advance on Bremen. Pop. 31,978.

**Delolme, JEAN LOUIS** (1740-1806). Swiss writer. His early life was passed in Geneva, where he was born and where he studied law and practised as an advocate. For one of his writings he



Della Robbia. Madonna and Child with saints, a typical terra-cotta relief by Andrea della Robbia

was obliged to leave the country in 1769, and until 1775 he lived mainly in England; but he died in Switzerland July 16, 1806. Delorme's fame rests entirely on his work on the English constitution. This appeared in French in 1771, and then in English, and until the rise of more critical scholarship was regarded as a standard book.

**Delorme**, MARION (1613-50). French courtesan. She was born at Blois, Oct. 3, 1613 and at an early age went to Paris, where she became as famous for her beauty as notorious for the succession of celebrated men who were her lovers, including Cinq-Mars, Condé, Richelieu, and the duke of Buckingham. Her house became known as a meeting-place of Fron-



Marion Delorme,  
French courtesan  
From a print in the  
*Bibl. Nat. Paris*

dists, and she was about to be imprisoned by the government when she suddenly died, July 2, 1650. Long afterwards it was said that she had escaped to England and married, that she returned to Paris, and lived on into the 18th century. She was the subject of a play by Victor Hugo, 1831, and of a novel by G. P. R. James, 1830. *Consult* Cinq-Mars, A. de Vigny, Eng. trans. W. Hazlitt, 1847; *Confessions* de Marion Delorme, E. de Mirecourt (pseud.), 1860.

**De l'Orme**, PHILIBERT (c. 1515-70). French architect. Born at Lyons, he spent some years in Italy, and after his return in 1536 came under the notice of the French court. On the accession of



P. De l'Orme,  
French architect

Medici, and though his monumental scheme was greatly modified by his successors, the design and plan were a memorable achievement. His great ability as a constructor supports his claim that he revolutionised building in France. He died in Paris, Jan. 8, 1570.

**Delos**. Smallest of the Cyclades Islands (q.v.). Formerly known as Asteria and Ortygia, according to the legend it came into being from a blow of Poseidon's trident, whence the name Delos (visible). Originally a floating island, it was fastened by Zeus with chains to receive the wandering Leto (Latoia), who there gave birth to Apollo and Artemis. Held sacred from the earliest times, it was the seat of a famous temple and oracle of Apollo, in whose honour the

Henri II he became architect to the king, for whom he designed a theatre at St. Germain-en-Laye. In 1564 he began the palace of the Tuileries for Catherine de'

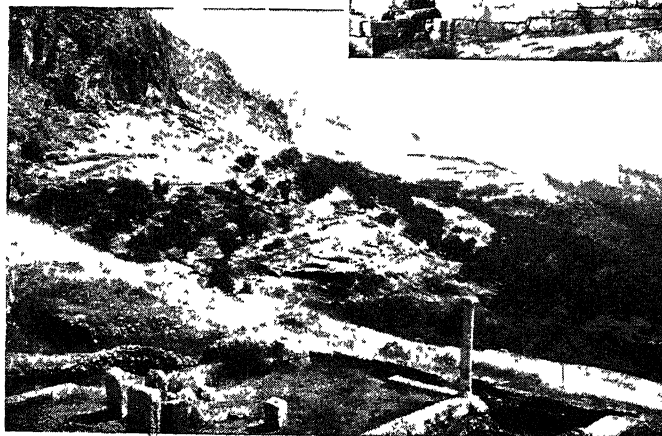
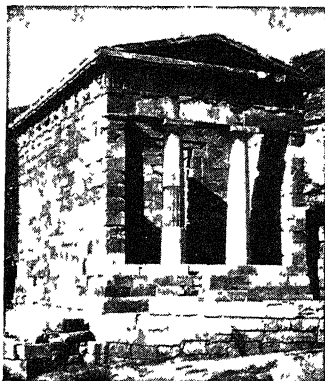
Delian games were held every five years. About 477 B.C. it became the treasury of the Delian League, a confederacy of Athens and other Greek states formed to resist the common enemy, Persia. About 458 the funds were removed to Athens, a step which led to the establishment of the Athenian empire.

After enjoying a long period of independence (322-161) Delos was again placed by the Romans under the control of Athens. From that time it enjoyed great prosperity as a commercial centre until in 87 it was sacked by a general of Mithradates. Excavations in the now deserted island, begun in 1829 and continued in 1873 and 1877 by French archaeologists, led to the discovery of important remains.

**Delphi**. Small town of ancient Greece, in Phocis, famous for its oracle of Apollo. The town lay on the S. slope of Mt. Parnassus; its inhabitants were Dorians and the government was an oligarchy. The principal seat of the worship of Apollo, Delphi was also associated with that of Dionysus, and every four years it was the scene of the celebration of the Pythian games. The temple of Apollo possessed great wealth of its own, and it was also used as a safe deposit for their treasures by many Greek states.

The oracular responses were given by a priestess called the Pythia, who, according to tradition, sat on a tripod placed in the centre of the temple over a chasm, from which a vapour arose from the river Cassotis flowing underneath. This vapour was supposed to give inspiration to the utterances of the priestesses. The oracle was regarded as being biased in favour of the Dorians. It was also noted for the ambiguity of its utterances (see Croesus). During recent years extensive excavations at Delphi have revealed the site of the temple and its surroundings, and many of the buildings described by ancient writers have been identified.

**Delphinidae** (Lat. *delphinus*, dolphin). Large family of aquatic mammals. Forming part of the sub-order of toothed cetaceans, its members are of small or medium size, mostly marine, and usually with numerous teeth in both jaws. There are two sub-families comprising respectively true dolphins, porpoises, killer whales, grampuses, blackfish or pilot whales; narwhals and belugas or white whales. Killer whales, which eat seals and small cetaceans, are the only members of the family that subsist on warm-blooded animals. All others feed on fishes and invertebrates, except a dolphin



Delphi. Ruins of the Gymnasium, looking east. Above, remains of the Treasury of the Athenians within the sacred precincts of the city

reputed to be a vegetable-feeder in the rivers of Cameroons. Fossil dolphins occur in pliocene crags.

**Delphinine.** Chief alkaloid contained in the seed of *Delphinium staphisagria*. It is very poisonous. It is prepared by percolating alcohol containing tartaric acid through the powdered seeds. The alcohol is evaporated off and the remaining liquid, freed from oil, is extracted with benzine. The alkaloid dissolves in the benzine, a little sodium bicarbonate is added, and then ether. This last extracts the delphinine, which separates out in crystals when the mixture is left standing. Delphinoidine is the other important alkaloid in delphinium seeds. Both alkaloids resemble aconite in action but are rather weaker. The seeds are used as a parasiticide.

**Delphinium** OR LARKSPUR. Genus of plants belonging to the family Ranunculaceae, natives of Great Britain, North America, and S.E. Europe. Hardy annuals and perennials, from 1 ft. to 6 ft. high, with blue, white or pink flowers, they are grown from seed sown in April where the plants are to flower, thinning out in May. The perennial kinds may be lifted and replanted in autumn or spring. They thrive in any ordinary garden soil.

**Delphinus.** One of the Ptolemaic constellations. Its first star lies near Pegasus, and the constellation is easily picked out, for its leading four stars, Alpha, Beta, Gamma, and Delta, form a lozenge with stars of almost equal brilliance. Ten stars of the constellation are noted in Ptolemy's catalogue. See Constellation.

**Delta.** Physical formation occurring at the mouth of certain rivers. Most rivers are loaded with silt, some of which tends to be deposited whenever the current of the stream slackens. The deposit of silt at or near the mouth of a river may take the form of a bar,

or may become a delta according to how the sea or lake currents react with the moving water of the river. When a slow-moving, heavily loaded stream flows into comparatively still water, the load is deposited more or less evenly to form a flood plain of alluvium just below the level of the water, with a steep, abrupt slope at the seaward edge. In course of time the inevitable surface irregularities in this level of alluvium cause the river to flow more readily in certain channels, and the banks of these channels are built up and rise above water level. In time the flood plain emerges permanently at its landward edge, and the river crosses it in a few channels, or distributaries, with banks slightly raised above the surrounding level. The delta has then become permanent.

The term delta comes from the shape of the Nile mouth which is like the Greek letter  $\Delta$ , but it now includes any formation where the river branches into distributaries.

The Po, Danube, Rhône, and Nile have deltaic mouths. The Mississippi has a delta which, in reality, begins at the mouth of the Ohio. It advances a mile in 15 years, and its area is 12,000 sq. m., while that of the Ganges-Brahmaputra covers 50,000 sq. m. The Rhône delta in Lake Geneva is 20 m. long, and has increased a mile in 1,900 years. At Buttermere and Crummock Water in the English Lake district, and at Lakes Thun and Brienz in Switzerland, a delta has made two lakes where there was formerly but one. See Danube; Mississippi; Nile; River, etc.

**Delta Amacuro.** Territory in the N.E. of Venezuela. It is mostly N. of the main river, and contains several mouths of the Orinoco which flow into the Atlantic. Serpent's Mouth Channel separates it from Trinidad. It has rich iron mines and exports cocoa. The capital is Tucupita. Pop. 28,165.

**Delta Connexion.** Alternating electric current is usually generated as three phase, i.e. in three distinct windings contained in each alternator at the power station. Each winding produces alternating currents which rise to a maximum one after the other in regular sequence (at 120° apart). When the windings are joined in a triangular formation, they are said to be connected in delta (after the Greek letter  $\Delta$ ). The same term is used for such a connexion of windings in an A.C. 3-phase transformer or motor.

**Delta Metal.** Alloy of copper and zinc, similar to but harder and stronger than brass. A typical

composition would be 55 p.c. copper, 42 p.c. zinc, 1-2 p.c. iron, and small amounts of manganese and aluminium. It is used in both the cast and forged conditions and may have tensile strengths of between 20-40 tons per sq. in., depending on its treatment. The name is derived from the Greek letter  $\Delta$ , or D, the initial of the discoverer, Alexander Dick. See Alloy; Brass.

**Deltoid Muscle** (Gr. *deltoeidēs*, delta shaped). Triangular muscle which covers the point of the shoulder. It is attached above to the clavicle (collar-bone) and to the scapula (shoulder-blade), and below to the outer surface of the upper part of the humerus (upper arm bone). Its chief action is to abduct the arm, i.e. raise it outwards from the body; the anterior fibres of the muscle also assist in drawing the arm forward, and the posterior fibres in drawing it backward. See Anatomy; Muscle.

**Deluge** (Lat. *diluvium*, washing away). The O.T. tells of a great flood which swept away all mankind with the exception of Noah and his family (Gen. 6). Noah was saved in an ark (*q.v.*), which, on the waters subsiding, rested on the mountains of Ararat (Armenia). To ascertain whether the ground was dry, Noah sent out first a raven and then a dove. The raven did not come back; the dove returned twice, bringing the second time the leaf of an olive tree, and then flew away altogether. After the flood God made a covenant with Noah that he would not bring another flood, and as a sign he set a bow (the rainbow) in the clouds.

A strikingly similar story is found in Babylonian literature in the Gilgamesh epic (c. 3000 B.C.). The epic is contained in cuneiform tablets, first deciphered in 1872. Gilgamesh is told the story of a flood by his immortal ancestor, Ut-napishtim. Ut-napishtim was advised by the god Ea to build a ship to escape the flood which Bel and three other gods were bringing upon Shurippak. The ship which he built was 120 cubits long and broad, had six decks and a mast, and was smeared with bitumen. When the rains ceased it rested on Mt. Nisir, E. of the Tigris. Then Ut-napishtim sent forth a dove, a swallow, and a raven, and the raven did not return. After the flood the god Ea made a covenant with Ut-napishtim. Another form of the Babylonian story has survived in the fragments of Berosus, an Egyptian priest who lived in the 3rd cent. B.C.



*Delphinium exaltatum*, or giant larkspur

**Deluge Legends.** Stories relating to the flood. Research has traced traditional tales of a primeval flood, local or general, more or less parallel with the Noah story, among peoples in every grade of culture. Besides the Babylonian epic of Gilgamesh, and the version by Berosus, flood-myths are traceable to Greece, across Persia, India, and Polynesia to America.

Interesting coincidences in detail occur. In India and Peru a warning is given; there may be one survivor or a few. The survivors escape by ark, as in Cambodia, by canoe, by a coconut shell, or by a turtle. They reach a mountain, animal messengers are sent out; the earth is repopled. That these myths are degenerate reminiscences of the Biblical story is no more admissible than the suggestion of their independent invention. They are explained as an element in the cultural drift observable throughout the eastward track of early mariners. See *Creation Legends*.

**Delusion.** A false belief. In mental disease it has generally three characteristics: first, it is evidently untrue; secondly, no amount of argument will correct it; thirdly, it tends to be inconsistent with the individual's education and surroundings. Despite the popular belief that a person may have a particular delusion, but be sane in all other respects, no delusion can exist as an isolated disorder, but is the superficial outcropping of some form of mental disease. For example, depressing delusions accompany melancholia; grandiose ideas are mainly met with in mania, general paralysis, and paranoia; delusions of jealousy and marital infidelity are common in alcoholic insanity.

A delusion must be distinguished from an illusion, which is a false perception of something actually seen or heard; and an hallucination, which is the vivid mental creation of something imagined as seen or heard. See *Hallucination*; *Illusion*; *Insanity*.

**Delville Wood.** Wood of France, in the dept. of Somme. It lies between Longueval and Ginchy, 10 m. E. by N. of Albert, and was the scene of heavy fighting in the First Great War. Some 159 acres in extent, and known to the British as Devil's Wood, it was attacked and taken from the Germans by a S. African brigade, July 15, 1916. The government of S. Africa purchased the wood from the French government in 1920, erecting thereon a South African national memorial which

was unveiled Oct. 10, 1926. See *Somme*, *Battles of the*.

**Delyannis, THEODOROS** (1826-1905). Greek statesman. In 1878 he represented Greece at the Berlin congress and was four times prime minister between 1878 and 1905. He was assassinated, June 13, 1905. Delyannis's life-long policy was the enlargement of Greece, and the recovery of its lost provinces from Turkey.

**Delysia, ALICE** (b. 1885). French actress. Born in Paris, March 3, 1885, she was a midinette before appearing on the stage of the Moulin Rouge in 1901. After playing in Paris music halls, she went to the U.S.A. in 1905. Her London debut in *Odds and Ends*, 1914, established her reputation as an actress of sophisticated charm and vivid personality. She starred in many of C. B. Cochran's revues, e.g. *Pell Mell*, 1916; *Mayfair and Montmartre*, 1922; *On with the Dance*, 1925; and in the musical plays, *Princess Charming*, 1928; *The Cat and the Fiddle*, 1933; *Mother of Pearl*, 1933. During the Second Great War she toured the military camps of the Near and Middle East, 1941-43.

**Demades.** Athenian orator and politician. He belonged to the pro-Macedonian party, and as such was a bitter opponent of Demosthenes. Twenty years after the overthrow of Greek independence at Chaeronea (338 B.C.) he joined a conspiracy to murder the Macedonian Antipater (*q.v.*). This was discovered and Demades put to death. Utterly unscrupulous, he is called by Plutarch (who acknowledges his eloquence) the shipwreck of Athens. *Prom. Deema-deez*.

**Demavend.** Loftiest peak of the Elburz Mts., Persia. Situated 45 m. N.E. of Teheran in Mazandaran prov., it is a snow-capped and dormant volcano. It yields lava and sulphur, and its alt. is estimated at 18,549 ft. The town of Demavend lies to the S. in Teheran prov.

**Dembinski, HENRYK** (1791-1864). Polish soldier. Born at Cracow, Jan. 16, 1791, he joined the army, 1809, and fought under Napoleon in the invasion of Russia in 1812. He distinguished himself as a cavalry commander in the Polish revolution of 1830, and on Kossuth's invitation accepted command of the Hungarian forces in 1848. Dembinski died in Paris, June 13, 1864.

**Deme** (Gr. *dēmos*). Name for a township or parish after Attica was divided by Cleisthenes (*q.v.*).

**Dementia** (Lat. *demens*, out of one's mind). Condition of weak-mindedness or mental degeneration, which may develop from other forms of insanity, or may be the result of physiological decay of the mind in old age. Mania, melancholia, general paralysis, epilepsy, chronic alcoholism, and injury to the brain following fracture of the skull or apoplexy, may all terminate in dementia. The senses gradually become weakened, the intellectual faculties reduced, and the memory impaired. Loss of self-control, irritability, and childishness are manifested. The patient then becomes dirty in his habits and requires constant attention. Periods of maniacal excitement or depression may occur and suicide may be attempted. Eventually, muscular weakness becomes extreme, the patient is bedridden, and death follows from pneumonia or prolonged exhaustion. Treatment is of little avail. See *Insanity*.

**Demerara.** River and settlement of British Guiana. The river rises in the Maccari mts. and, flowing N., almost parallel with the lower Essequibo, enters the Atlantic at Georgetown; its length is about 180 m., of which some 80 m. are navigable by large ships. The settlement lies mostly between the rivers Demerara and Berbice, and fronts the sea for some 65 m. It was originally a Dutch colony. The kind of brown sugar known as demerara was originally produced in this colony. See *Sugar*.

**Demerara.** This city, capital of British Guiana, originally the Dutch Stabroek, is now called Georgetown (*q.v.*).

**Demesne** (Lat. *dominium*, lordship). Name for a certain class of land, the modern form being domain. On manors in feudal times demesne was the land kept by the lord for himself, as distinguished from that granted to his tenants. Similarly, demesne of the crown was land retained by the king; and this now forms the crown lands. Ancient demesne is land that was in the hands of the king at the time of the Norman conquest. The word is sometimes used for the land attached to a large residence. See *Manor*.

**Demeter.** In Greek mythology, goddess of agriculture, whose Roman counterpart was Ceres. She was the daughter of Cronos and Rhea, and by Zeus became the mother of Persephonē (Proserpine). Her daughter was carried off by Pluto, the god of the underworld, as she was gathering flowers near Enna in Sicily. Demeter set

out to look for her daughter, and was told by Helios (the sun-god) what had happened. Zeus having declined to assist her, Demeter refused to allow the earth to produce any of its fruits until her daughter was restored to her. Eventually Zeus agreed to have Persephonē brought back from Hades, provided she had eaten nothing during her stay in the underworld. It so happened, however, that Persephonē had eaten a pomegranate seed in the Elysian Fields, and it was impossible to do more than arrange for her to spend six months of the year with her mother and six months with Pluto.

The story is an allegory of the process of agriculture. Persephonē, during her stay in the lower world, is the seed planted in the ground. When she returns to her mother she is the corn rising from the earth. The rites of the festivals associated with Demeter, the Eleusinia (*q.v.*) and the Thesmophoria (*q.v.*), symbolised the growth of corn, and probably the process of life, death, and life beyond the grave. The mysteries of these festivals were close secrets. *Prom. Deemeeter.*

**Demetrius.** Name of a Russian prince and of several pretenders. The prince, a son of Ivan the Terrible, was murdered in 1551, after his father's death. About 1600, in the reign of Boris Gudunov, a pretender from Galicia claimed to be the dead prince. Various influential people, including the Jesuits, acknowledged him. He joined the Church of Rome, and having gathered an army, invaded Russia proper. He defeated the tsar's troops, entered Moscow, and, Boris having just died, was crowned tsar in 1605. Demetrius reigned for about a year, until he was killed at Moscow, May 17, 1606. A second false Demetrius appeared about 1607. He collected a large army, the people believing he was the dead prince, defeated the Russians, and ruled for a time over a large part of their country. He was killed in Dec., 1610. The third Demetrius was recognized as tsar by some of the Cossacks, but was executed 1612.

**Demetrius Nicator** (d. 125 B.C.). King of Syria, 146–140 and also 129–125 B.C. The son of Demetrius Sôtēr, he regained the throne with the help of Ptolemy Philometor, king of Egypt. Taken prisoner in a campaign against the Parthians, he remained ten years in captivity. Demetrius recovered his kingdom about 129. A few years later, defeated by a usurper, Alexander Zabinas, he fled to Tyre, where he was murdered.

**Demetrius Phalereus** (c. 345–283 B.C.). Athenian orator and statesman. Born at Phalerum in Attica, a pupil of Theophrastus, he was appointed administrator of Athens by Cassander in 317 and held the position for ten years. He made himself so popular that the grateful citizens erected 360 statues in his honour. When Demetrius Poliorcetes conquered Athens in 307, the populace, instigated by his opponents, condemned him to death. After finding refuge in Alexandria, where he was kindly received by Ptolemy Lagus, he was banished by the latter's successor to Upper Egypt, where he died.

**Demetrius Poliorcetes** (337–282 B.C.). King of Macedonia. Son of Antigonus (*q.v.*) king of Asia, he assisted his father in his campaigns against his rivals, and drove out the garrison of Cassander from Athens. For this he was acclaimed by the city as its liberator. At the siege of Rhodes, which lasted a year, he gained his surname Poliorcetes (the besieger) from the machines constructed by him to break down the defence. In 301 he and his father met Cassander and Seleucus at the battle of Ipsus, in Phrygia, and were completely defeated. Antigonus was slain, and it was not until 294 that Demetrius could occupy Macedonia, which he ruled till 288, when he was driven out by Pyrrhus (*q.v.*). He died in Asia, the prisoner of Seleucus.

**Demetrius Sôtēr** (d. 150 B.C.). King of Syria, 162–150 B.C. The son of Seleucus IV, and grandson of Antiochus the Great, he was brought up in Rome, where he had been sent by his father as a hostage. On the death (164) of Antiochus IV Epiphanes he escaped and returned to Syria, where he was received as king, after he had murdered Antiochus V Eupator (162). After a short reign, during which he was engaged in wars with the Jews led by Maccabaeus, he fell in battle against the pretender Alexander Balas. The Babylonians called him Sôtēr (saviour) because he liberated them from the tyranny of the satrap Timarchus.

**Demi** (Fr., half). In heraldry, human beings, animals, and monsters are often shown cut in half, when they are described as a *demi-man*, *demi-lion*, etc. The upper or fore half is always shown unless specified. Many inanimate charges are similarly treated.



**Demi in heraldry** similarly treated.


**Demijohn.** Originally *Dame Jeanne*, the nickname humorously given to a type of large (up to 10 gall.) bottle, bulging, with narrow neck, usually with wicker casing.

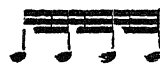
**De Mille, Cecil Blount** (b. 1881). American film director. Born at Ashfield, Mass., Aug. 12, 1881, he was educated at the Pennsylvania military academy and the American academy of dramatic art. Dramatic author and actor until 1913, he then abandoned the theatre to produce films, becoming director of Famous Players Lasky, and president of Cecil B. de Mille productions. His silent films, *e.g.* The Ten Commandments, King of Kings, The Sign of the Cross, were spectacular entertainment based on quasi-Biblical themes. Though crude and extravagant productions, they were among the first pictures to feature thousands of performers. His later pictures included The Plainsman, 1937; Union Pacific, 1939; Reap the Wild Wind, 1942; The Story of Dr. Wassell, 1944; Unconquered, 1948; Samson and Delilah, 1949.



Cecil B. de Mille

His sister Agnes was a dancer and choreographer. Her ballets included Three Virgins and a Devil, 1946, and she was responsible for the dances in Oklahoma, 1943.

**Demisemiquaver.** In music, a small note, equal in time-value to half of half a quaver, as its name indicates. Its form is that of a quaver with three black strokes on the stem,  Like quavers, demisemiquavers may be grouped thus with continuous strokes:



**Demiurge** (Gr. *demiourgos*, artisan, architect). Name given by ancient philosophers to the Creator of the world out of chaos. According to the Gnostics, the Demiurge was a being subordinate to the Supreme Being, in some respects evil, partly identified with the Jewish Jehovah.

**Demmin.** Town of Poland, in Masuria. Formerly Prussian, it stands on the river Peene, 30 m. S. of Stralsund. It has a trade in wheat and timber, and manufactures textiles, beer, etc. An old fortified place, it was a member of the Hansatic League. Its fortifications were levelled in 1759. Pop. 12,378.

**Demobilisation.** Process of disbanding soldiers from compulsory military service and returning them to civilian life. At the end of the First Great War, countries in which conscription was the normal method of raising armies demobilised their troops by releasing them in yearly classes. In Great Britain soldiers were demobilised according to the requirements of industry. Each serviceman had his industrial group, actual trade, and whether he was married or single, entered in his pay-book. There were 43 industrial groups, and the U.K. was divided into 19 areas for the purpose of dispersal. Men over 41 were discharged first, and thereafter the order of priority was: miners, men required for demobilisation clerical work, men whose return to civil life created employment for others, key men required by industry; and men who had positions waiting for them. Demobilisation began on Dec. 11, 1918, and was completed in May, 1920. Each man not an officer received 28 days' leave with full pay, ration and family allowances, unemployment insurance paid up for a year, and any gratuity due.

A more equitable system of demobilisation for men who had served in the Second Great War was announced on Oct. 14, 1944, to take effect at the end of the war in Europe. The scheme divided service personnel into two categories of release, A and B. In Class A, men and women were released by groups based on a combination of age and length of service; two months of service equalling one year of age. Thus a man aged 22 with four years' service was in the same group as a man aged 40 with one year. Class A men received eight weeks' leave with full pay, ration allowance and, where applicable, family and dependants' allowances, and war service grant. Each man had an outfit of civilian clothing. At the end of his discharge leave came such gratuity as was due to him. Men qualified in respect of foreign service received an extra day's pay and allowances for every completed month overseas. At the expiry of their release leave, men from all three services were placed in a special reserve, to be recalled only in extreme emergency. Officers and men were treated alike. Women received the same benefits, except that they were given cash in lieu of clothing.

Class B was voluntary; it was restricted to those normally

employed in certain industrial categories. They received three weeks' leave and emoluments, but payment for foreign service and of gratuities was held over until after the state of emergency had ended. At the end of leave, they were directed to reconstructural employment, and were liable to

individual recall should such employment be discontinued.

The demobilisation of all three services began on June 18, 1945. At the end of 1948, by which time the demobilisation of war service personnel was almost complete, releases had totalled 4,984,180 men and 478,870 women.

## DEMOCRACY: RULE BY THE PEOPLE

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*Few words have become so widely and frequently misused and misunderstood as the word democracy, which is here given clear and authoritative definition. The subject is treated from other aspects under such headings as Government; Politics; Sovereignty; State, etc.*

The term democracy is one which has improved in meaning with the progress of political science. It was first used by the Greeks; and Aristotle, in his *Politics*, distinguishes six types of government, three good, and three perverted. The three good types of government were constitutional government, aristocracy, and kingship. The three bad types were democracy, oligarchy, and tyranny. The distinguishing factor between these classes was whether, as in the good type, government was in the interests of the community as a whole, or whether, as in the bad type, it was in the interest of the ruling class. The conception of democracy, i.e. government by the masses, as a perverted type was due to Aristotle's distrust of the plain drift away from aristocracy which was taking place in the Greek city states in his day; although it should be pointed out that, from Aristotle's point of view, aristocracy meant government, not by a superior class, but by the best persons within the state, i.e. persons specially qualified by abilities, training, and experience for government.

Aristotle's conception of constitutional government, or *polity*, corresponds fairly closely with modern conceptions of democracy, in the sense that laws should be framed in the interests of the community, with the assent of as large an active element of the community as possible. One further comment upon his conception must be made. In discussing both constitutional government and democracy, Aristotle was necessarily thinking of the *direct* participation of numbers of citizens in the work of government. This was possible in the Greek city states, and again in Rome, so long as the structure of government of a city state was retained. The ancient world never developed the conception of representative

institutions. This was the particular contribution of England to political theory, although even in England, the house of commons represented only a small, propertied class within the community, until the Reform Act of 1832 ushered in an era of rapidly extending democratisation, culminating in adult suffrage.

In recent times, democracy has tended to become something of a political slogan, and has been used in contrast to such terms as dictatorship, or totalitarian regime. Yet democracy is not strictly today a *form* of government at all. It may exist in many different forms. For example, in Great Britain, it has slowly evolved within a unitary state, under an unwritten constitution. Its outstanding characteristic is parliamentary sovereignty, i.e. the capacity of parliament to make or unmake laws, free from any external legal check. As a consequence of parliamentary sovereignty, a government depends for its continuance in office upon the support of a working majority in the house of commons. Control by the community at large is directly possible only through the medium of a general election, although during the life of parliament the pressure of public opinion both upon government and upon parliament is considerable.

The U.S.A. possesses a different form of democracy. This operates within the limits of a written constitution, which can be changed with difficulty; it affords an illustration of a far-reaching division of governmental power, which Montesquieu thought was the principal safeguard against arbitrary power. The American constitution exhibits two distinct types of division of power. In the first place, it divides power between the central government and the governments of the separate states. Certain topics are



reserved for the central government; the remainder are the province of the state governments. Secondly, both in the central government and in the government of the states, there is a separation between legislative, executive, and judicial power. The American president is elected by popular vote for a fixed term, and is not a member of either house of congress. The position of a governor of a state is similar. Both president (or governor) and congress (or state legislature) can thus independently assert that they correctly interpret the will of the people; and if both sides persist in their attitude, there is no immediate way of resolving this deadlock. Moreover, the judiciary has power to pronounce a law, whether passed by congress or by a state legislature, unconstitutional, *i.e.* not in accordance with the written constitution, and it thereupon becomes null and void. No similar power can be possessed by an English court, owing to the omnipotence of parliament.

#### Characteristics of Democracy

Clearly, then, the essence of democracy lies deeper than the form of government; it has been well said that democracy is not so much a form of government as a way of life. Its chief characteristics from this point of view may be summed up as follows:

1. An essential test of democratic government is that it should, at regular intervals, submit itself to the test of free election by the adult community as a whole. In recent years, in some dictatorships, lip-service has been paid to democratic ideals by sham elections, with candidates selected by the ruling party, and with no adequate guarantee (*e.g.* by secret ballot) for freedom of choice.

2. There should be freedom to express views in opposition to those of the dominant party; and if the popular vote should be adverse to the party in power, some alternative party should be ready to undertake the responsibilities of office. This principle is carried so far in the English constitution that the leader of the opposition has a defined constitutional position, and receives a salary. The opposition is, in a very real sense, "His Majesty's Opposition." Thus, under both the American and British forms, the democratic system works best where there are two well-organized parties of comparable strength, each of which has enjoyed periods of office in the fairly recent past.

It is the freedom to advocate differing political programmes and the alternation of parties in government which distinguishes Anglo-American democracy from, *e.g.*, the Soviet one-party state.

3. All persons, whether private citizens or public officials, should be equally accountable for their acts before some tribunal. In the 19th century it was assumed that all persons should be equally accountable before the ordinary courts of the state, but during the past sixty years there has been a steady growth of administrative law and an increase of administrative tribunals. Such a development is consistent with democratic theory if the tribunals apply a known and certain set of legal rules and if the forms of justice are scrupulously adhered to in proceedings before them. Here again democracies are sharply differentiated from totalitarian regimes in which a political party enjoys a privileged position, and is not answerable in the ordinary courts for many classes of acts. Such a position is often associated with a system of secret police, organized to maintain it.

4. Equally important in a democratic state is the independence and impartiality of the judiciary which, in the last resort, is the bulwark of the liberty of the ordinary citizen. Hence, in all totalitarian regimes, the party in power has destroyed both the independence and the impartiality of the judiciary, and has substituted "political" justice, designed to further its political objectives.

#### Maintenance of Freedom

5. Finally, a striking characteristic of democracy is the maintenance of fundamental freedoms for the ordinary citizen: freedom of speech and of the press, freedom of association, freedom from arbitrary arrest for alleged offences unknown to the ordinary law. In both England and the United States these freedoms are the product of long constitutional struggles; they are embodied in the common law and additionally assured by such great constitutional documents as Magna Carta (1215), the Bill of Rights (1689), and the Declaration of Independence (1776). To invade these rights would therefore be to destroy the very foundations on which the English and American political systems have been built up.

In recent years there have been criticisms of the Anglo-American conceptions of democracy as being concerned mainly with political

liberty rather than with economic security. Such criticisms are somewhat wide of the mark, since the achievement of the fullest possible popular control of government has been a necessary condition precedent to the attainment of what is sometimes called "economic democracy." Critics also emphasise another conception of democracy which finds expression in the Soviet system. The Soviet state is built upon the conception of economic security for all who work, and its function is conceived as being the protection of that security. It therefore prohibits all activities and expressions of opinion which may be regarded as threatening the position and rights of the Soviet worker. Though this conception differs widely from the "liberal" idea of democracy which finds expression in Western Europe and in America, it is not necessarily antagonistic to it.

*Bibliography.* Aristotle's Politics, ed. Weldon, 1901; Elements of Politics, H. Sidgwick, 4th ed. 1901; Modern Democracies, Viscount Bryce, 1921; Grammar of Politics, H. Laski, 1925; Western and Soviet Democracy, R. Schlesinger, in Yearbook of World Affairs, 1947.

**Democrat.** Member of one of the two principal political parties of the U.S.A. Founded by Thomas Jefferson, third president, to promote political principles in opposition to those of Alexander Hamilton, it stood for direct popular control of the government, the protection of states' rights against encroachments of the federal government, extension of the suffrage and the fullest grants of personal liberties consonant with law. Until 1828 it was called the Democratic Republican party. It was almost continuously in power until it split over the slavery issue in 1860. Between 1860 and the election of F. D. Roosevelt in 1932, the Democrats secured only four presidential terms—those of Cleveland in 1884 and 1892, and of Woodrow Wilson in 1912 and 1916.

Latterly the party has favoured a low tariff in international trade, for revenue only; and has become much more internationally-minded. Roosevelt's New Deal revolutionised American political theory and practice, achieving unprecedented expansion of federal powers to promote social and economic welfare. The party's left wing, which supported Roosevelt's New Deal, is very far from its largely Southern right, which was hostile to many presidential policies.

**Democritus** (c. 460-357 B.C.). Greek philosopher. Born at Abdera in Thrace, he was the most notable exponent of the atomic theory of the universe, which has been revived by modern chemists and physicists. The atoms conceived by Democritus differed in size, weight, shape, position, and arrangement. Falling together by force of gravity, impinging one upon another, and flying off in various directions as a result of impact, these atoms produced a rotatory movement or vortex. Gradually all atoms found their proper combinations, and thus the universe was formed, the result of a 'fortuitous concourse of atoms.' Democritus was known as the laughing philosopher by reason of his optimistic outlook on life.

**Demologos.** U.S. warship, the first steam-propelled battleship ever built. Designed by Robert Fulton and launched Oct. 29, 1814, she was a twin-hulled structure, a 16-ft. paddle-wheel working in the space between them. She was 150 ft. long and 56 ft. beam, with a tonnage of 2,475. The gun-deck was protected by a bulwark of timber nearly five ft. thick, and the armament consisted of thirty 32-pounder guns intended to fire red-hot shot, together with two 100-pounder under-water guns in the bows, predecessors of the modern submerged torpedo-tube. She was destroyed by fire, June 4, 1829.

**De Monarchia.** Dante's treatise on government written in Latin about 1314. His argument is that God has ordained a universal monarchy to exist side by side with the universal church, and has bestowed this upon the Romans. The prince who Dante hoped would restore this universal Roman monarchy was Henry of Luxembourg, who was chosen emperor in 1306, entered Italy in 1310, and died in 1313. Eng. trans., P. H. Wicksteed, 1904 (in Latin Works of D. A., Temple Classics). See Dante; King.

**Demonetisation.** Financial term meaning that certain coins are declared to be no longer money or legal tender. Thus by the Coinage Act of 1889 all gold coins of the United Kingdom minted before 1837 were demonetised. In a somewhat different sense it is used when one of the precious metals—silver in the United Kingdom, for instance—is no longer coined at its intrinsic value. It is then called token money, and is only legal to a limited extent. See Coinage.

**Demonology** (Gr. *daimon*, spirit; *ogos*, science). Branch of the study of religion, concerned with supernatural beings, below the rank of gods, which are regarded as cap-



Democritus, Greek philosopher  
From a bust in the Capitol Museum, Rome

able of influencing human life. Out of the generalised spirit-world of early animism emerged the conception of beings with special functions, such as disease-demons, corn-demons. In later developments they were sometimes numbered, such as the three fates, the four children of Horus. For the most part, however, they were individually nameless.

In some phases of primitive culture the physical universe is deemed to be pervaded by supernatural beings, which may be departed souls of men and animals, the offspring of *incubi*, *succubae*, and other obsessions, or discarnate spirits of unearthly origin. They include the spirits of wind, fire, and water, and legions of others, such as those which characterise the animism of E. Asia and negro Africa. Experience shows them to be friendly, hostile, wayward, or neutral, not necessarily of deliberate intention. In process of time the friendly were held to be innately benignant, and the hostile innately malignant.

With the growth of the idea of supreme beings, possessing personal names and definite qualities, polydemonism passed into polytheism. The nameless spirits hereupon came to be regarded as beings of lower rank, sometimes as the agents of the greater powers, sometimes as sharing the worship offered to them. Some of them represented the energies of nature, dethroned deities of older faiths, or those of subjugated or rival peoples.

Early animism knew nothing of the principle of dualism as applied to the moral government of the universe. The good and evil with which it was concerned were material rather than ethical. The notion of moral evil being directed by

demonic beings became associated with the monotheism of W. Asia. Out of this arose the definite distinction between angels and fiends which, by creating the separate study of angelology, relegated demonology to the consideration of evil spirits which, in popular usage, is its sole concern.

The Moslem world, with its jinn afrits, and ghouls, developed out of the primitive animism of nomad Arabia, overlaid by elements derived from Jewish and Christian thought. Side by side with this Semitic demonology is to be placed that of the Aryan-speaking peoples, with their *genii* or guardian-spirits and familiars, their fates and valkyries, giants and elves, vampires and werewolves, goblins and trolls. The influence of many of these is still extant in popular superstition.

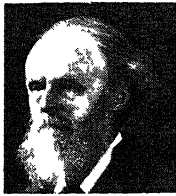
**DEMONIC POSSESSION.** The attribution of many mental and bodily ailments to the objective presence of intrusive demons is widespread in primitive thought. Their expulsion by ritual means is called exorcism. At the beginning of our era this belief partook throughout W. Asia of the moral aspect of demonism already mentioned. Its relationship to Christian teaching and practice is shown in works devoted to the history of N.T. times. See *Demonic Possession in the New Testament*, W. M. Alexander, 1902; *Primitive Culture*, E. B. Tylor, 4th ed., 1903; *Devils and Evil Spirits in Babylonia*, R. C. Thompson, 1904-5.

**De Morgan, AUGUSTUS** (1806-71). English mathematician. Born at Madura, India, the son of an army officer, he graduated at Trinity College, Cambridge, and was elected first professor of mathematics at the newly founded University of London in 1828. His influence on contemporary mathematics in England was far-reaching, and he had much to do with the foundation of the London Mathematical Society. His *Essay on Probabilities*, 1838; treatises on the *Differential and Integral Calculus*, 1842; and *Budget of Paradoxes*, pub. 1872, are among his most important works. De Morgan resigned his professorship in 1866, and died March 18, 1871. See *Memoir*, S.E. De Morgan, 1882.

**De Morgan, WILLIAM FRIEND** (1839-1917). British novelist. The son of Augustus De Morgan, he was born in London, Nov. 16, 1839, and educated at University College. After studying at the Royal Academy, he devoted himself to working in pottery and glass. It was not until he reached his 66th year that his first novel, *Joseph*



Vance, was written. It had an immediate success, and was followed by Alice for Short, 1907; Somehow



William De Morgan,  
British novelist  
Russell

Good, 1908; It Never Can Happen Again, 1909; An Affair of Dishonour, 1910; A Likely Story, 1911; and When Ghost Meets Ghost, 1913; and the unfinished The Old Madhouse, published posthumously. De Morgan is weak in plot construction, but his characterisation is good, and his descriptions are true to life. He died Jan. 13, 1917.

**Demosthenes** (c. 383-322 B.C.). Athenian orator and statesman. Left an orphan at an early age, he was brought up under the care of guardians who played havoc with his patrimony. On reaching manhood he prosecuted the guardians, and obtained a verdict against them, though most of the estate was irrevocably lost. To equip himself for this trial, Demosthenes had studied under Isaeus, the great forensic orator, and his success seems to have encouraged him to seek a career in advocacy and in public life. His natural disabilities were great. It is said that to cure his stammer he practised speaking with his mouth full of pebbles and declaimed in front of the sounding waves of the seashore in order to accustom himself to the clamour of popular assemblies. His private speeches continued till 355 B.C.

#### Demosthenes as Statesman

By this time he had amassed a competence and was free to devote himself entirely to politics. As a statesman he stood head and shoulders above any man of his time. The great ideal of his life was the regeneration of Athens as leader of the Hellenic world, and the burden of his earlier speeches was that Athens must purify herself within, and also by a moderate and enlightened foreign policy win the confidence of the other Greek states. It was not long before Demosthenes saw danger ahead in the overweening ambition of Philip of Macedon. A number of aggressive acts made it clear that Philip was only waiting an opportunity to impose his will upon Athens and Greece.

From 351 onwards Demosthenes delivered a series of masterly speeches of which the most notable are the Olynthiacs and the Philipics, in which he endeavoured

to awaken his countrymen to the menace from the north. Though the word philippic has come to mean any speech of fierce abuse, these orations were instinct with sincerity. Too late the Athenians listened to his pleadings, too late they adopted the national military service he advocated; Philip had had time to mature his plans, and the defeat of Athens and Thebes at Chaeronea in 338 was the death blow of Greek independence. Demosthenes himself fought in the battle, but, it must be confessed, fled incontinently from the field. The majority of his countrymen, however, recognizing that behind natural physical cowardice lay the soul of a great patriot, forgave Demosthenes for his flight, and in 336 B.C. Ctesiphon proposed that a golden crown be



Demosthenes, Greek orator and statesman

From a statue in the Vatican, Rome

given to Demosthenes for his public services, the ensuing litigation evoking his oratorical masterpiece. (See Aeschines.)

The death of Philip in 336 encouraged in Demosthenes fresh hopes of shaking off the Macedonian yoke, but Philip was succeeded by his greater son Alexander and the Macedonian domination continued. In 324 Harpalus, the treasurer of Alexander, absconded with a large portion of his monarch's money and sought refuge in Athens. He indulged freely in bribery, and among those accused of taking a bribe was Demosthenes, an accusation probably due to his enemies. However, Demosthenes was condemned and

thrown into prison. Escaping, he lived abroad, until the death of Alexander in 323 emboldened the Greeks to make a bid for independence. The Athenians recalled their statesman from exile, and Demosthenes headed the movement. Greek hopes, however, were finally shattered at the battle of Crannon in 322, and to avoid falling into the hands of the Macedonians Demosthenes committed suicide. *Pron.* Dee-mos-then-eez.

*Bibliography.* Text, ed. F. Blass, 1885-89, S.H. Butcher, 1903, etc. Eng. trans. C. R. Kennedy, in Bohn's Classical Lib., 5 vols., 1852-63; consult also Demosthenes (an account of his life and works), S. H. Butcher, 1881; The Attic Orators from Antiphon to Isaeus, R. C. Jebb, 1893.

**Demosthenes.** Athenian general in the Peloponnesian war. In 413 B.C. he was sent with reinforcements to Syracuse during the disastrous Sicilian Expedition. Defeated at sea, the Athenian forces, in endeavouring to retreat by land, were compelled to surrender in a body, and Demosthenes was put to death by the Syracusans.

**Demotic** (Gr., belonging to the people). Cursive script used for general purposes in ancient Egypt. It was an abbreviated and modified form of the hieratic or priestly script, usually written from right to left, mostly in black. Well established by 700 B.C., it became the common means of correspondence and record, on papyrus or potsherd, in Ptolemaic times. Used in an epigraphic form on sepulchral and official stelae, it formed one of the three versions inscribed on the Rosetta and Canopus stones. It disappeared soon after the 4th century A.D. A few characters, introduced to eke out the Greek alphabet, survived in Coptic writing.

**Demotika** or **DIMOTIKA.** Town of Bulgaria, the ancient Didymotichos. Situated on the Maritza, on the frontier of S.E. Bulgaria, it is about 25 m. S. of Adrianople (Edirne). Important in the Middle Ages, it decayed under the Turks.

**Dempsey, JACK** (b. 1895). An Irish-American boxer. Born William Harrison Dempsey, he sprang to fame on July 4, 1919, by knocking out the world heavyweight champion Jess Willard. Dempsey held the championship seven years, his most sensational victory being in the fifth round against Georges Carpentier, July 2, 1921. Beaten on points over 10 rounds, after terrific battles with Gene Tunney, Sept. 23, 1926, and Sept. 22, 1927, he left the ring for the entertainment business.

**Dempsey, Sir Miles Christopher** (b. 1896). British soldier. He was born Dec. 15, 1896, and educated at Shrewsbury and Sandhurst. He was commissioned in the Royal Berkshire Regiment in 1915 and served in France and Iraq. Promoted lieutenant-col. in 1938, he distinguished himself at Dunkirk in the Second Great War, and was given command of the 13th corps in 1942. He led the British 2nd army with conspicuous success from the Normandy landings of June, 1944, until its disbandment the following June. On Sept. 3, 1945, he succeeded Gen. Slim as commander of the 14th army, later becoming c.-in-c. Allied Land Forces, S.E. Asia. In 1946, Dempsey became c.-in-c., Middle East, in succession to Gen. Paget, and the same year was promoted general. He resigned from the army in 1947, on his appointment as chairman of the Racecourse Betting Control board. He was created K.C.B. in 1944.

**Dempster, Thomas** (c. 1579-1625). Scottish scholar. A native of Aberdeenshire, he was educated at Pembroke Hall, Cambridge, Louvain, Rome, Douai, and Paris. He was professor of humanities at Toulouse, oratory at Nîmes, civil law at Pisa, and humanities at Bologna, where he died, Sept. 16, 1625. Knighted by Urban VIII, he edited Claudian, composed Latin poetry, and in 1613 edited the *Antiquitatum Romanorum Corpus Absolutissimum* of Joannes Rosinus. He was the author of *Historia Ecclesiastica Gentis Scotorum*, pub. at Bologna in 1627, ed. for the Bannatyne Club 1829.

**D.E.M.S.** The common abbreviation for *Defensively Equipped Merchant Ship* (g.v.).

**Demurrage** (Lat. *demorari*, to delay). Term used in shipping and other business circles for the money compensation for unexpected delays in unloading ships, wagons, etc. If a merchant, when unloading his goods, detains a ship longer than the stipulated time he pays demurrage to the owner at a certain sum per day. Similarly demurrage is paid, if necessary, by those

who detain railway wagons, barges, etc. See Freight.

**Demurrer.** In English law, an objection that the plaintiff's case, as disclosed on his pleading, shows no legal cause of action. Demurrers, as such, are now abolished.

**Demy.** Size of paper or of bound books. A demy sheet of printing paper measures 22½ ins. by 17 ins.; of writing or drawing paper, 20 ins. by 15½ ins. Books are sized approximately as follows: Demy folio, 17½ ins. by 11½ ins.; demy quarto or 4to, 11½ ins. by 8½ ins.; demy octavo or 8vo, 8½ ins. by 5½ ins.; demy 16mo, 5½ ins. by 4½ ins.; 18 mo, 5½ ins. by 3½ ins. See Paper, Sizes of. *Pron.* dem-eye'.

**Demy.** Name given to the scholars of Magdalen College, Oxford, because originally their allowance was half (*demi*) that of a fellow. In addition to the ordinary or junior demies, the equivalent of scholars elsewhere, there are senior demies, who pursue advanced branches of study. See Magdalen College.

**Denaby Powder.** British permitted explosive of the non-nitro-glycerine type, containing about 35 p.c. of ammonium nitrate sensitised by 13.5 p.c. trinitrotoluene. The reduced content of ammonium nitrate is compensated for by the addition of about 35 p.c. potassium nitrate, and 18.5 p.c. ammonium chloride is added to lower the explosion temperature. Denaby Powder No. 2 is supplied in sheathed form.

**Denain.** Town of France, in the dept. of the Nord. It stands near

the junction of the Escaut (Schelde) and the Selle, 5 m. S.W. of Valenciennes, and is connected with neighbouring towns by rly. Its growth is due entirely to the opening of the coal mines around it, since about 1850. Steel, machinery, and glass are manufactured. Here in 1712 the French marshal Villars gained a victory over Eugene of Savoy. Pop. 24,908.



Denarius. Obverse and reverse of this Roman coin

**Denarius** (Lat. *deni*, ten each). Chief silver coin of ancient Rome. It was equivalent to 10, afterwards to 16, copper asses. It is the "penny" of the N.T. (in the American R.V. "shilling.") See As; f. s. d.

**Denazification Trials.** Trials of suspected Nazis in German courts, following the Allied occupation in 1945. See Nazism.

**Denbigh.** Mun. bor. and county and market town of Denbighshire, Wales. It is 29 m. W. of Chester, with a railway station. On an eminence in the Vale of Clwyd, Denbigh is engaged in the timber, butter, and poultry trades, and near by are slate, lime, and



Denbigh arms

other quarries. Here are the N. Wales mental hospital, free grammar and Bluecoat schools, and the ruins of a Carmelite priory. Denbigh castle, in which Charles I sought asylum in 1645, was built by Henry De Lacy. Market day, Wed. Denbigh gives its name to a co. div. returning one M.P. Pop. 8,100.

**Denbighshire.** Northern maritime county of Wales, with about 10 m. of coast-line on the Irish sea. Mountains occur in the S. (Moel Sych, 2,713 ft.), the E. is hilly, and towards the N. the surface becomes flat. The valleys of the Clwyd, Conway,



Denbighshire. Map of this maritime county of North Wales

and Dee (Vale of Llangollen) are noted for their picturesque scenery. Oats, barley, wheat, and rye are



Denbighshire arms

cultivated, dairy-farming and pony and sheep-rearing are important industries, and coal, lead, zinc, and fire-clay are among the mineral products. Prehistoric remains abound, and some of the oldest rocks in the British Isles occur. In the extreme E. of the co. a small area belongs to Flint. Denbigh is the co. town, Colwyn Bay the chief holiday resort. Two members are returned to parliament. Area 665 sq. m. Pop. 157,648.

**Denbighshire Series.** Grits and flags in the middle division of the upper Silurian system. They extend from Conway through Pentre-Voelas to a point midway between Rhayader and New Radnor. The Pen-y-glog and Moel Farna beds are contemporaneous with the Wenlock group; those of Nantglyn and Dinas Bran with the lower Ludlow shale. In the N.W. graptolites abound.

**Dendera**, TENTERIS, OR TENTERA. Village near the left bank of the Nile, between Kena (Qina) and Luxor. It is celebrated for the temple dedicated to the goddess Hathor, identified by the Greeks with Aphrodite. This well-preserved temple was begun by Ptolemy XIII, father of Cleopatra. Its architecture is of great beauty; built of sandstone, it is composed of two rectangles, the first with a façade with six sculptured columns, the second containing the sanctuary of the temple. There are numerous passages and treasure-hiding-places, and the walls bear a rich series of inscriptions. A small building on the roof was used for the worship of Osiris. Valuable excavations here were made by Petrie. Close by is a small temple of Isis, built under the emperor Augustus, and in the neighbourhood is a cemetery with tombs from the IV to the XI dynasties. Consult Denderah, W. M. Flinders Petrie, 1900.

**Dendermonde** OR TERMONDE. Town of Belgium, in the prov. of E. Flanders. It stands where the Dendre joins the Schelde, 25 m. S.W. of Antwerp. The chief church is the Gothic Notre Dame, with two

paintings by Van Dyck and a 12th century font, and the chief secular building the town hall, a 16th century edifice on the Grande Place, but both were seriously damaged by the Germans in Aug., 1914. The chief industry is the making of cloth, but the town is an agricultural centre of some importance.

Dendermonde began as a small place in the duchy of Brabant. With that duchy it was included in Burgundy, and later in the Spanish Netherlands. It was fortified, and in 1667 the citizens, by opening the sluices, drove back an attacking army of Frenchmen. Soon, however, the French took the fortress, which was recovered by Marlborough in 1706, and in 1715 it passed to Austria. In 1815 it was given to the new kingdom of the Netherlands; in 1830 to Belgium.

**Dendritic Structure.** Formation, resembling a fern growth, seen in specimens of certain alloys



Dendritic Structure. Example in a copper-phosphorus alloy, mag. 65

when a polished and etched section is viewed under the microscope. The alloys which exhibit this phenomenon are those which form solid solutions. If such an alloy is cooled from the molten state so slowly that equilibrium conditions are reached, the crystal grains formed will be of the same composition throughout and appear under the microscope like a

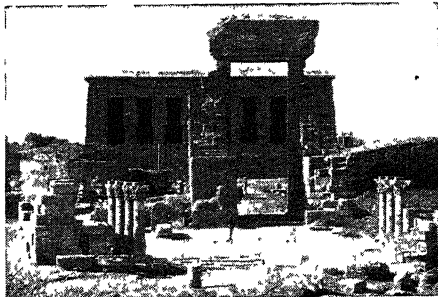
pure metal. If cooling is too fast the individual grains will not be homogeneous and a "cored" or "dendritic" structure will result. The formation of core alters the composition of the remaining liquid so that the next metal solidified forms a shell of different composition round the core and this process is repeated until the whole mass is solid. An example of this structure is the copper alloy shown in the illustration.

**Dendrobium** (Gr. *dendron*, tree; *bios*, life). Large genus of the family Orchidaceae. Chiefly natives of India, Malaya, and Australasia, they are all epiphytes, but differ greatly in habit—some having a creeping rhizome, others a few small pseudo bulbs, others again club-shaped stems. The flowers differ enormously in size, some minute, others very large; some solitary, others in many flowered sprays. The chief character of the genus lies in the lip (labellum) of the flower, which is contracted at the base, where it lies upon or grows to the foot of the column. See Orchid.

**Dene.** Name given to a deep, wooded dell or valley. It is common in English place-names, e.g. Tenterden, Marden, Rolvenden, and Biddenden, all in Kent.

**Dene-Hole** (A.S., valley-hole). Ancient excavation, chiefly in Essex, Kent, and the Somme valley. There are 72 within four acres near Grays, in Essex. A round shaft, 3 ft. across, was sunk through gravel, sometimes for 60 ft., until chalk was reached. A bell-shaped chamber, 16–22 ft. high, sometimes with trefoil branches, was then formed. The most reasonable theory is that they were chalk quarries, as mentioned by Pliny, or store chambers.

**Dengue**, DANDY FEVER, OR BREAKBONE FEVER. Acute disease of tropical and sub-tropical countries, particularly India, Asia Minor, Africa, and the West Indies. It appears to be conveyed by mosquitoes, and spreads very rapidly. The symptoms are those of high fever, with redness of the face and usually a rash on the skin, sore throat, headache, severe pain in the muscles, and pain and swelling of the joints. This condition persists for three or four days, when the temperature falls and the patient's condition improves. After another three or four days the fever and pains return, then gradually abate. Though causing severe emaciation and loss of strength, it is rarely fatal or permanently injurious. Pron. denggay.



Dendera. Isolated pylon of the Temple of Hathor. Behind is the Great Vestibule of the building

**Denham.** Parish and village of Buckinghamshire, England, lying 15 m. W.N.W. of London by rly. from Paddington or Marylebone. Denham golf club has a separate station. Film studios are the chief concern of the district. Pop. 2,609.

**Denham, Dixon** (1786-1828). British explorer. Born in London, Jan. 1, 1786, he served in the Peninsular and Waterloo campaigns, and made an expedition across the Sahara during 1822-23. In 1824 he explored parts of the coast of Lake Chad. In 1828 he was made governor of Sierra Leone, but he died there of fever on May 8, 1828.

**Denham, Sir John** (1615-69). English poet. He was born in Dublin, where his father was lord

chief justice, and educated at Trinity College, Oxford.

During the Civil War he attached himself to the Royalist cause, and after the Restoration received a knighthood. In



Sir John Denham,  
English poet  
From an old print

1642 he brought out the successful tragedy of *The Sophy*, but he is chiefly remembered for his poem, *Cooper's Hill* (1642). Denham is buried in Westminster Abbey.

**Denia.** A town and seaport of Spain, in the prov. of Alicante. It stands on the slopes of a hill, facing the Mediterranean, 45 m. N.E. of Alicante, and is connected by rly. with Alicante and Valencia. Manufactures include textiles, esparto fabrics, and nails, and large quantities of fruit are exported. Founded as *Hemerokoskeion* by the Greeks, it afterwards became the *Dianium* of the Romans; it was enriched by the Moors, and has many remains of antiquity, including the famous temple of *Diana*, from which the town was named, and a mosque. It was besieged and captured by an Anglo-Spanish force in 1813. Pop. 12,612.

**Denikin, Anton Ivanovich** (1872-1947). Russian soldier. Born Dec. 4, 1872, he entered the army in 1887, and saw active service in the Russo-Japanese War, 1904-05. During the First Great War he was promoted general, but first came into prominence in 1917,



Anton Ivanovich Denikin

when he was made c.-in-c. Russian South-Western armies. After the Lenin-Trotsky *coup d'état* of Nov. he withdrew to Rostov and took part in the formation of the volunteer army under Alexeiev, after whose death, Oct., 1918, he succeeded to the command. In 1919 Denikin cooperated with Koltchak against the Bolsheviks, and at first had remarkable success. Early in 1920 his armies collapsed, and he came to England. After 1926 he lived mostly in France, but he died at Ann Arbor, Mich., U.S.A., Aug. 8, 1947.

**Deniliquin.** Municipality of New South Wales, Australia, in Townsend co. It lies between the Murray and Murrumbidgee rivers, and is the terminus of a rly. to Echuca in Victoria, 40 m. to S.S.W.

**Denim.** Cotton fabric for overalls, etc., usually in twill weave, with closely packed yarns, designed to withstand heavy wear.

**Denis, DENYS, or DIONYSIUS.** (d. c. 275). Patron saint of France. He was born in Italy, and was sent by Pope Fabian in the 3rd century as a missionary to Gaul. He became bishop of Paris, and built a church on an island in the Seine. At the instigation of the pagan priests he was beheaded with two companions by the Roman governor. Four hundred years later a church and a Benedictine abbey were erected on the site of his martyrdom. In the Middle Ages he was identified with Dionysius the Areopagite (q.v.). His festival is kept on Oct. 9.

**Denis, HENRI.** Belgian soldier. General Denis was minister of Defence when Germany invaded Belgium in May, 1940, and after King Leopold's capitulation he went with the cabinet to Bordeaux. At a meeting there on June 18, he declared in favour of remaining in France and following the French government to Vichy, rather than establishing a Free Belgian government in England.

**Denis, LOUISE MIGNOT** (c. 1710-90). Niece and companion of Voltaire. She had been left a widow in 1744, and when in 1758 Voltaire retired to Ferney, she kept house for him. A number of Voltaire's letters are addressed to her; after his death she married the *Sieur du Vivier*.

**Denis Duval.** Novel by W. M. Thackeray, uncompleted at his death. As much as had appeared in *The Cornhill Magazine* was published posthumously in 1867. Though but a fragment, the story, an historical one of the late 18th century, is of high merit.

**Denison.** City of Texas, U.S.A. In Grayson co., it lies near the Red river on the Oklahoma border, 70 m. N. of Dallas, and is served by rlys. Completed in 1944, the Denison dam is the largest earthen structure of its kind in the world, forming a lake with a shore line of 1,200 m. Army engineers took six years to construct it. It provides flood control for four states. Denison trades in vegetables, fruit, and farm produce, and makes textiles, cotton-seed oil, and machinery. Grape culture is being developed. The town was incorporated in 1873 and chartered as a city in 1891. Pop. 15,581.

**Denison.** Cape on the coast of Adélie Land (q.v.), Antarctica. It was discovered and named by Mawson, of the Australasian Antarctic expedition, 1911-14, which here established its main base.

**Denison, GEORGE ANTHONY** (1805-96). British divine. Was born at Ossington, Notts, Dec. 11, 1805.

Educated at Eton and Christ Church, Oxford, he became a fellow of Oriel, where he was at the heart of the High Church movement.

He obtained a living in 1838, and from 1851 until his death, March 21, 1896, he was vicar of East Brent, Somerset, and archdeacon of Taunton. Denison is remembered chiefly for his High Church views and practices, which led to a lawsuit before the privy council. Some attribute to him the institution of harvest festival services.

His elder brother was Viscount Ossington, the Speaker, and two other brothers attained eminence: Edward Denison (1801-54), bishop of Salisbury from 1839 until his death, and Sir William Thomas Denison (1804-71), governor of New South Wales, 1854-61, and governor of Madras, 1861-66.

**Denitrification** or **DENTRATION.** Biochemical term expressing the removal of nitric acid from a mixture or the removal of nitrates from the soil. All plants and animals require nitrogen for their growth; the larger ones cannot directly make use of the nitrogen in the air, but minute organisms, e.g. some bacteria, are capable of converting the nitrogen of the air into nitrates. These nitrates are used by plants for their growth, and the plants



G. A. Denison,  
British divine

provide nitrogen compounds for cattle, sheep, and other animals. Many leguminous plants have nodules on their roots, each nodule consisting of thousands or millions of such bacteria, amounting to a few tons per acre of a field of peas.

When the ground is properly cultivated there are enough bacteria for the needs of the leguminous plants and enough nitrates for many other plants. The bacteria need carbohydrates, which are supplied by the plants; but if the ground is not properly cultivated the bacteria diminish in number and the soil each year becomes less fertile. This process is denitrification; the remedy is the addition of nitrogenous fertilisers, such as sulphate of ammonia, or better cultivation by digging and hoeing, leaving fallow, or growing an occasional crop of peas or beans.

**Denizen** (Lat. *de*, from; *intus*, within). Term used in English law for an alien who has received from the crown letters patent of denizenship conferring some of the privileges of a British subject. See Alien; Naturalisation.

**Denizli**. Town of Asiatic Turkey, in the vilayet of Denizli. It stands in a valley, amid vine-clad hills, 50 m. S.E. of Alashehr, and is connected by rly. with Izmir. The town is famous for its gardens, and near it are the ruins of Laodicea. It has considerable trade in leather. Pop. of town, 15,787; vilayet, 285,225.

**Denman, THOMAS, 1ST BARON** (1779-1854). British judge. Born in London, Feb. 23, 1779, and educated at Eton and St. John's College, Cambridge, he became a barrister in 1806. With Brougham he defended Queen Caroline in 1820. Attorney-general in 1830, he became lord chief justice in 1832, and was made a peer in 1834. He retired 1850, and died Sept. 22, 1854.

His great-grandson Thomas, who became 3rd baron in 1894, was born Nov. 16, 1874, and educated at Sandhurst before serving in the South African War. During 1911-14 he was gov.-gen. of Australia. He became deputy speaker of the house of lords.

**Denman, GERTRUDE MARY, LADY** (b. 1884). British organizer. Daughter of the 1st viscount Cowdrey (*q.v.*), she was born Nov. 7, 1884, and educated privately. She married the 3rd Baron Denman in 1903. A member of the executive committee of the Women's National Liberal Federation, 1909-10, she was chairman

of the sub-committee of the Agricultural Organization society which introduced women's institutes into England and Wales during the First Great War, and chairman of the National Federation of Women's Institutes, 1917-45. In 1939 she was appointed hon. director of the Women's Land Army (*q.v.*), resigning in 1945 on the government's decision to withhold from members financial benefits

similar to those granted to the enlisted services.

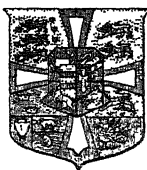
**Denman Glacier**. Huge ice-flow on the coast of Queen Mary Land (*q.v.*), Antarctica. Emerging between Capes Jones and Harrison, it was discovered by the Mawson expedition, 1911-14. It descends N. between Mounts Sandow (4,000 ft.) and Amundsen, E.; and Mounts Strathcona and Barr Smith (about 4,320 ft.), W.

## DENMARK: THE COUNTRY & ITS PEOPLE

A. D. INNES and \*HENRY BAERLEIN

*This article gives a description of Denmark, afterwards dealing with its language, literature, industries, and history. For more detailed information see the articles on Copenhagen and other towns, and on the country's kings, statesmen, and men of letters*

Denmark comprises a northward projecting peninsula of the central European plain, Jutland (Danish *Jylland*), and an archipelago of several islands of which the most important are Zealand (*Sjælland*), Fünen, Langeland, Lolland, Falster, Moen, and the



Denmark arms

outlying island of Bornholm in the Baltic. The area of Denmark is 15,042 sq. m., excluding the area added as a result of the plebiscite in Slesvig, which was an outcome of the treaty of Versailles. Jutland is separated from Norway by the Skagerak, from Sweden by the Kattegat, and from Germany by the Fehmarn Belt. The Danish Archipelago blocks the passage between the Kattegat and the Baltic, leaving only three narrow and comparatively shallow channels, the Sound (*Oresund*) between Sweden and Zealand, the Great Belt between Zealand and Fünen, and the Little Belt between Fünen and the mainland. The Sound is the most direct route for traffic to and from the Baltic; but the Great Belt, entirely within Danish sovereignty, is deeper, navigable by vessels drawing over 23 ft.

Denmark is a low-lying level country with little diversity of physical features except in the rocky island of Bornholm. In Jutland the highest elevation, Himmelberg, is only 560 ft. With the exception of Bornholm, which consists of old rocks, virtually the whole surface of Denmark is covered with deposits of boulder clay overlying cretaceous rocks. The soils are mainly sand and clay. About one-fifth is peat bog, moorland, and sandy waste. The W. coast of Jutland is low, unin-

dented, and fringed with sand dunes, behind which lie lagoons. These sandy wastes continue southwards into the N. Frisian Islands off the coast of Slesvig, and northwards to the curved spit known as the Skaw or Skagen. Shoal water and several reefs fringe the W. coast. The most notable are Horn Reefs, near which the naval engagement called the battle of Jutland was fought May 31-June 1, 1916.

The E. coast is somewhat higher, and, being faced with rather deeper water, is more accessible. Numerous inlets afford small safe harbours. Limfjord, which cuts in half the N. part of Jutland, is a series of salt lagoons covering an area of about 600 sq. m. Its continuity from sea to sea is of fairly recent occurrence. The waters are too shallow for navigation, but afford natural nurseries for young plaice and other fish. The indented coasts of the islands of the Danish archipelago afford numerous small harbours and have always been favourable to the development of seamanship. The climate is comparable to that of eastern Great Britain, but has a warmer summer and colder winter. Rainfall is not heavy, particularly in the E. There are considerable areas of beech forest.

Racially the Danes are Scandinavians of Teutonic stock, who early succeeded the allied Cimbric. In Greenland, the only colony of Denmark, Danes form a small minority confined to traders, pastors, and officials.

**CONSTITUTION.** The present constitution is based on the *grundlov* or charter of 1849, modified in 1915 and 1920. Denmark is a limited monarchy; King Frederick IX succeeded his father Christian X in 1947. The sovereign has executive power exercised

through his ministers. He is also head of the Evangelical Lutheran Church. The *Rigsdag* or diet embraces two houses: the *Folketing* (house of commons) and the *Landsting* (senate). All men and women of Danish nationality more than 25 years of age and permanently resident in Denmark possess the franchise and are eligible for election to the *Folketing*, which has 148 members; 117 members are elected by proportional representation in 23 districts, and 31 seats are divided among parties not obtaining sufficient returns at the district elections.

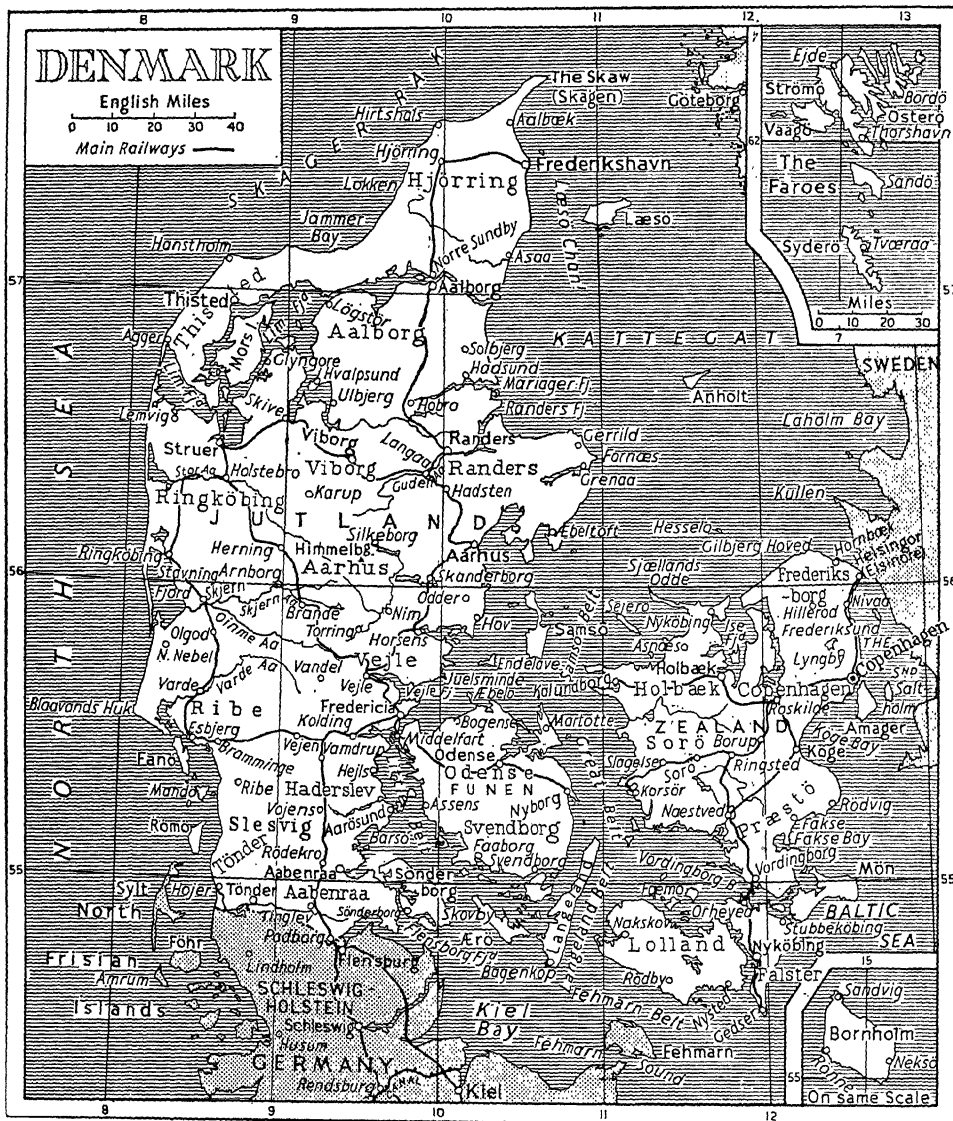
The term of the legislature is four years, but the king has power to dissolve the *Folketing* earlier. Members of the *Landsting* are elected indirectly by voters of 35 years of age by a complicated method of proportional representation; they sit for a term of eight years.

**EDUCATION, ETC.** Education was made compulsory in 1814 and the school age is from 7 to 14. The public schools, which exceed 3,700, are mostly free. Higher education is provided at the university of Copenhagen, founded 1479, which has five faculties and about 6,500

students, men and women; and the university of Aarhus, opened 1933, with about 1,000 students.

Social legislation was codified in 1933, including public assistance and insurance acts. There is a system of old age pensions payable under certain conditions to aged poor over 60 years of age. About 140,000 people are in receipt of pensions. In peace-time there is no capital punishment.

Military service before the Second Great War was compulsory for all males at the age of 20, conscripts serving one year in the active army, after which they



Denmark. Map of the little Scandinavian kingdom. Inset are maps of Bornholm and the autonomous Faroe Islands



served eight years in the reserve. The navy was for coast defence only.

**INDUSTRY, ETC.** Agriculture is the principal activity, occupying over half the population. The crops are barley, oats, rye, and a little wheat. Potatoes and beet-roots are also extensively grown. Hay, pasture grass, and lucerne must be regarded among the principal crops, since the growth of cereals is really secondary in importance to the dairy industry for which several of the crops are grown. Maize, oil cake, and other feeding stuffs are imported for this industry. Large quantities of butter and eggs are exported. The prevalent system of small holdings has done much to foster intensive agriculture and the farmers' co-operatives to rationalise marketing. The utilisation of the waste in butter-making has led to a great increase in pig-rearing and much export of high-grade bacon.

In the absence of coal, water power, and metallic ores, manufactures are not extensive. Much sugar is produced from home-grown beets, and there is a growing manufacture of margarine. The abundance of hides has led to glove and leather industries at Copenhagen, Randers, Odense, and elsewhere. China clay from Bornholm is used in the famous porcelain and terra-cotta works of Copenhagen. There are small manufactures of woollen and linen goods. Danish shipbuilders were among the first to fit oil engines to large merchant vessels.

#### Roads and Railways

Internal communications are well developed. Roads are numerous and kept in good repair. There are over 3,100 m. of railways, of which nearly half are owned by the state. The telegraph and, especially, the telephone systems are highly efficient.

The imports are mainly fuel, feeding stuffs, textiles, metals, and hardware, and the exports butter, eggs, bacon, and livestock. Under normal conditions imports come mainly from the U.S.A. (grain, etc.), Germany, and the U.K. (coal and manufactured goods), while exports go chiefly to Germany and the U.K.

Copenhagen is the chief port, and the only one that can receive large vessels. The new free port at Copenhagen dates from 1893: it is one of the busiest commercial centres in the Baltic. Aarhus, on the E. coast, is the largest town in Jutland. Aalborg on Limfjord is the chief centre in the N. Odense

is the principal town in Fünen. Frederikshavn is the port for Norway, and Esbjerg the chief port for Hull. Flensburg in Slesvig has a partly German community.

An estimate of the population on Jan. 1, 1945, was 4,024,000. About half the pop. is urban, and Copenhagen, the capital, had 890,130 inhabitants at the 1940 census. Nearly all Danes belong nominally to the Lutheran Church, except for some 22,000 Roman Catholics and 6,000 Jews.

The only colonial possession of Denmark is Greenland. The Farøe Islands, formerly governed as part of the home country, were granted autonomy in 1947. Iceland proclaimed its independence in 1944.

**LITERATURE, ETC.** The old language of the Danes occurs in Runic inscriptions of the Viking period, but Danish, as a distinct language, began to develop from the old Norse about the 11th and 12th centuries. Three dialects eventually developed, those of Skane, Zealand, and Jutland, the last named ultimately becoming the literary language of Denmark.

Danish literature was late in developing owing to the use of Latin and, later, German as means of literary expression. In the 12th century Saxo Grammaticus wrote his *Historia Danica*, which includes much folk-lore in addition to history. The *Kjaempeviser*, old Danish ballads, probably date from the 11th or 12th century, but were not published until the 16th century. *Rijmkronike*, a rhymed history of Denmark, published in 1495, was the first book printed in the country.

Christian Pedersen published an epoch-making translation of the Bible (1550) and some mythical stories of Charlemagne. H. J. Ranch was the first dramatist: his works include *The Crowning of Solomon* and *Samson's Prison*. A. Kristensen Arrebo, author of the *Hexaëmeron*, was the first poet of note. Thomas Kingo, of Scots descent, and Hans Brorson were writers of hymns half a century later. The beginning of modern Danish literature was marked by Ludvig Holberg, historian and dramatist, whose *Peder Paars* (1719) was a satire on contemporary Danish life. Hans Gram was a notable historian of that period.

Poetry then began to develop largely under the influence of the French school. Johannes Ewald wrote *Adam and Eve*, *Rolf Krage*, and *Balder's Death*. Johan Wessel, by his satirical play, *Love without*

*Stockings* (1772), did much to turn opinion once more towards Danish national sentiment. The reawakening of interest in national literature was helped by Peter Suhm, with his *History of Denmark* down to 1400; Knud Rahbek, critic, poet, and dramatist; Rasmus Nyerup, critic and historian, and Jens Baggesen, satirist and humorous poet.

The 19th century was marked by a romantic revival in Danish literature largely through German influence. To this school belonged Schack von Staffeldt, a German by birth, who nevertheless made the Danish language his own and excelled in the lyric; Adam Öhenschläger, Denmark's greatest poet, best known by his tragedy *Hakon Jarl* and the poem of the *Golden Horns*; Steen Blicher, a realistic story writer; the poet antiquarian and religious revivalist, Nikolai Grundtvig; the critic and playwright, Johan Heiberg; and the dramatist, Henrik Hertz.

#### Great 19th Century Writers

The most widely known name slightly later was that of Hans Andersen, whose fairy tales made him world-famous. A reaction against the narrowness of national sentiment in literature was signalled by Georg Brandes, the famous critic, who after bringing on himself a storm of abuse was eventually acknowledged as one of Denmark's greatest writers. J. Jacobsen, Sophus Schandorph, and Karl Gjellerup were among the adherents of the Brandes school. At the end of the 19th century, in opposition to Brandes, there grew up a new romantic school, devoid of exotic influences. The leaders were Holgar Drachmann, Henrik Pontoppidan, J. Jørgensen.

Great sculptors include H. W. Bissen, B. Thorwaldsen, and J. A. Jerichau. The Danish school of painting shows much Dutch influence. Among the best known painters are Jakob Carstens and Carl Eckersberg.

Danes have long been notable in the world of science. H. C. Oersted discovered electro-magnetism; J. F. Schouw wrote on geographical botany; J. J. S. Steenstrup was noted for his zoological work; Niels Finsen discovered the effect of light rays on certain skin diseases; Niels Bohr was a founder of nuclear physics. Danish Arctic explorers, whose work has been done principally in Greenland, include W. A. Graah, H. Rink, K. J. Steenstrup, C. F. Wandel, Mylius Erichsen, Einar Mikkelsen, and Knud Rasmussen.

**HISTORY.** The Danes first appear definitely on the stage of history towards the close of the 8th century, when Charlemagne was waging war upon the Saxons. During the 9th century they and their Norwegian kindred were harrying the coasts and estuaries of the British Isles and Western Europe (see Viking). In the 10th century the process of consolidation was advancing among the Scandinavian peoples; both in Denmark and in Norway the kingship was establishing itself; and the old irresponsible Viking raids became less active.

#### Canute the Great

Christianity began to take way among the Danes in the 10th century, in the time of Harald Bluetooth, who, after long struggles, established himself as king of Denmark. He was followed by Sweyn, Swegen or Sven Forkbeard, who, in 1013, made himself king of England, and who was followed in 1014 by Canute or Knut the Great. Canute ruled mightily and succeeded for the moment in uniting the crown of Norway with those of Denmark and England. On the extinction of his own family, the Danish succession was secured by his nephew Sweyn, the son of Estrid, Canute's sister, whose dynasty lasted for four centuries.

The next notable name is that of Waldemar the Great (1157-82). In the interval, when Denmark had been constantly torn by struggles for the throne between rival members of the house of Estrid, she had also been harassed by the savage Wendish tribes who occupied the S. shore of the Baltic. Waldemar and his son, Canute VI, turned their arms successfully against the Wends, and extended their dominions over Holstein, Mecklenburg, and Pomerania. A still further extension of dominion eastwards over Estonia won for Waldemar II (1202-41) the title of the Victorious; but in the middle of his reign most of the conquered dominions, with the exception of Estonia and the island of Rugen, recovered their independence.

After Waldemar's death a situation arose not unlike that in Scotland after the death of Robert Bruce. The kings were not strong enough to curb the nobility, and the nobles were more concerned to extort and assert privileges for themselves than to unite for the welfare of the State. Complete disruption was averted by the strenuous rule of Waldemar IV, called Atterdag (1340-75), who, at his death, left his dominions at least undiminished, and the authority of the crown considerably increased.

Waldemar had no son, but his daughter Margaret was the wife of Haakon VI, king of Norway. The Danes made her young son Olaf king, while Margaret herself was appointed regent. With Haakon's death in 1380 the young Olaf became king both of Denmark and of Norway, while Margaret was regent in both countries.

Olaf died in 1387. Margaret's own reign lasted till 1412, but the situation proved unmanageable in less capable hands. Under Eric, Norway and Sweden found themselves subordinated to Denmark, Denmark itself was ill governed, and the king met with no success in his struggles with the Hanseatic League. He was deposed in 1439, and was succeeded by his nephew, Christopher III (d. 1448).

Denmark and Norway elected Christian I of Oldenburg as king; the Swedes claimed the right of electing their own monarch. Christian at the same time acquired the succession to Slesvig and Holstein, which remained with the Oldenburg dynasty of Denmark until 1863, though held as fiefs of the German Empire. Christian I, John, and Christian II, each with temporary success, sought to recover the crown of Sweden. Christian II endeavoured to secure his position by a massacre known as the Bloodbath of Stockholm, Nov. 8, 1520, when many of the leading nobles, clergy, and Stockholm townsmen were slaughtered; but this piece of "frightfulness" met with its due reward in the revolt of the Swedes led by Gustavus Vasa, and the permanent separation of Sweden from Denmark in 1523.

#### The Counts' War

Christian was deposed in 1523, in favour of his uncle, Frederick of Holstein-Gottorp. On Frederick's death in 1533 there was a three years' struggle for the crown, known as the Counts' War, between his son Christian III and the deposed Christian II, who was favoured by the Church on account of the Lutheran proclivities of his rival. In the reign of Frederick II, the son of Christian III, a fresh attempt was made to recover the crown of Sweden. The treaty of Stettin in 1570 left Denmark still in possession of Norway and of Scania and other provinces in the Swedish peninsula.

In a long reign of 60 years, Frederick's successor, Christian IV, greatly advanced the internal prosperity of Denmark, but his excursions into foreign politics were unhappy. As a prince of the German empire he intervened on behalf of the Protestant states in the Thirty Years' War, but after a short

struggle was overwhelmed and forced to retire by the Imperialists, his place being shortly afterwards taken by the formidable king of Sweden, Gustavus Adolphus.

Jealousy of Sweden caused an outbreak of open hostilities in 1643, with the result that the peace of Bromsebro (1645) transferred to Sweden sundry provinces which had hitherto been retained by Denmark. The battle with Sweden was renewed by Christian's son, Frederick III, in 1657, when Charles X of Sweden, "the Pyrrhus of the north," was king of Sweden. An amazing campaign, in which Charles marched across the frozen seas into Jutland, brought Denmark to her knees, and she had to surrender Scania, though in 1659 the Danes and Norsemen succeeded in driving the Swedes from the footing they had won in Jutland and Norway.

#### Revolution of 1660

In 1660 the clergy and burghers united to carry through a revolution which swept away the excessive privileges enjoyed by the turbulent nobility, and at last concentrated the effective power under the direct control of the crown. But for this revolution it is doubtful whether the independence of Denmark would have survived the next half century. All the powers with interests in the Baltic—Russia, Poland, Brandenburg, and Denmark—shared a common jealousy of the power of Sweden. But Sweden, under Charles XI, was saved from being overwhelmed, partly by the ability of the young king, and partly by the intervention of Louis XIV.

When Charles XI died in 1697, Russia, Poland, and Denmark thought that their opportunity had come with the accession of Charles XII, but his military qualities made him more than a match for his enemies. By a sudden onslaught on Denmark, he compelled her to withdraw entirely from the alliance (1700). When Denmark ventured to renew the attack later, the reappearance of Charles on the scene threatened her first with the loss of Norway and then with perhaps still greater disasters, but she was saved by the death of Charles in 1718, and the struggles of the northern powers were brought to an end by the treaty of Nystad (1721).

Like other neutral countries, Denmark was inconvenienced by the naval claims of Great Britain when the supreme maritime power was at war. In 1780 she joined the Armed Neutrality, but without effect. In 1801 her indignation was





1. Fisher girl of Skonshoved. 2. A village bride. 3. Fisherman 4. Typical farmstead. 5. Lutheran prelate  
6. North Danish woman. 7. Girls from Randers. 8. Modern thatched farm house. 9. Peasant girl spinning.  
10. Woman from Fano. 11. Country couple in holiday dress

**DENMARK: HOMESTEADS AND TRADITIONAL COSTUMES OF THE COUNTRY**

roused by the action of Great Britain, which compelled the surrender of the Danish fleet (*see* Copenhagen, British Attacks on), and Denmark was constrained to join the circle of Napoleon's dependants; and by the congress of Vienna in 1815 she was deprived of Norway, which was handed over to Sweden.

Though Denmark had suffered considerably, her recuperation was rapid, and there followed a degree of political enfranchisement. Then, with the middle of the century, the Slesvig-Holstein question reached an acute phase. In the two provinces there was a Danish and a German party. The technical question of their precise relations to the Danish crown was, in fact, insoluble; the demands of the two parties were irreconcilable, and the complication became worse with the death of Frederick VII in Nov., 1863, and the passing of the crown to Christian IX. of Glücksburg.

Austria and Prussia united to enforce the separation of the duchies from the sovereignty of the new royal house of Denmark, overwhelmed the resistance of the Danes, and forced on Denmark in 1864 the treaty of Vienna, the result of which was the absorption of the duchies by Prussia—an unjust oppression which it was left to the peace conference at Versailles to correct. Denmark remained neutral during the First Great War. North Slesvig was officially reunited to the country in 1920.

**THE SECOND GREAT WAR.** In May, 1939, at the request of the Germans, the Danes signed with them a non-aggression pact for ten years. The Germans broke it, crossing the Danish frontier at dawn on April 9, 1940, and occupying strategic points in Copenhagen and elsewhere. Having no defences, the Danes offered no resistance, and by evening virtually the whole country was in German hands.

For three years the Germans tried to win over the Danes and to represent Denmark as a model protectorate, while exploiting the country's industrial capacity and plundering it of food. But passive resistance and active sabotage grew in strength. Ninety p.c. of the electorate voted in the general election of March, 1943, casting nearly two million votes (143 seats) for the anti-Nazi parties against less than 68,000 (representing 5 seats) for pro-Nazis.

Reprisals followed successful acts of sabotage, strikes followed

reprisals, deportations and executions followed strikes. At the end of Aug., 1943, the Danish government resigned—even the most pro-Nazi among them could not agree to the trial of saboteurs by German courts; and Gen. von Hanneken, German c.-in-c., assumed full powers. Sabotage continued, one of the most spectacular efforts being the destruction in June, 1944, of the Riffel Syndikatet factory at Copenhagen, third largest factory making automatic weapons in Europe.

No battles were fought on Danish soil, and Denmark suffered little from aerial activity. A pinpoint attack on Oct. 31, 1944, by 24 R.A.F. Mosquitoes wrecked two buildings of the university of Aarhus, used as Gestapo h.q. for Denmark and containing thousands of documents relating to the population and resistance.

#### Post-War Recovery

During the closing stages of the war, and subsequent expulsion of Germans from the new Poland and elsewhere, 345,000 Germans took refuge in Denmark; they remained a problem until the last of them were accepted into Germany, Feb. 15, 1949.

The unconditional surrender to F.-M. Montgomery on May 4, 1945, of German forces in N.W. Europe freed Denmark. Immediately the Danish resistance movement took charge, rounding up collaborators and disarming German troops. An all-party govt. under a Social Democrat premier was formed on May 5. Elections held in Oct. reduced Social Democrat representation from 66 to 48, and gave the Communists (forbidden in the previous election, 1943) 18 seats; but no party had a majority. A right wing govt. took office until in Oct., 1947, new elections increased Social Democrats to 57, reduced the Communists to 9, and a Social Democrat minority govt. was formed.

The fact that the Germans had maintained Denmark's agriculture for their own benefit gave her a sound basis for rapid recovery. She participated in the European Recovery Programme (*q.v.*), and was a signatory of the North Atlantic treaty, April 4, 1949.

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**Denmark Hill.** London suburb at the extreme W. of the borough of Camberwell, adjoining Brixton, with a rly. station. Ruskin lived here 1864-71 and his name is perpetuated in Ruskin Park (where Mendelssohn's Spring Song was composed); Sir Henry Bessemer lived and died in the mansion now known as Bessemer House. King's College Hospital was removed here in 1913 from Portugal Street, Lincoln's Inn Fields.

**Denmark Strait.** Wide channel between Iceland and Greenland. It connects the N. Atlantic with the Greenland Sea.

**Denomination** (*Lat. denominare*, to name). Word meaning originally a particular class of persons or things, one to which a special name has been given. Its most common use is for a religious body.

From it comes the word denominationalism, one much employed in controversies about religious teaching, and meaning the teaching of the special tenets of one body of Christians rather than those that are common to all. Denominational schools are those in which the religious teaching takes this form, and before the Education Acts of the 19th century a large number of elementary schools in England and Wales were of this type.

#### Denominations, THE THREE.

Name applied to the Presbyterian, Congregational, and Baptist denominations. It was due to the fact that in 1727 they were organized in London into The General Body of Protestant Dissenting Ministers of the Three Denominations, and had the right of directly approaching the sovereign with an address on certain occasions.

**Denotation** (*Lat. denotare*, to mark out). In logic, the full extent of that which a word includes; all the objects of which a certain predicate can be used taken together. It was first used by J. S. Mill as opposed to connotation: the word white denotes all white things, but connotes the attribute whiteness. *See* Logic.

**Density** (*Lat. densus*, thick). The amount of matter in a given volume of a substance. Absolute density is the amount of matter in unit volume of a substance; relative density or specific gravity (*q.v.*) is the ratio of the mass of a given volume of a substance to the mass of the same volume of another substance usually taken as a standard. *See* Boyle's Law.

**Dent, EDWARD JOSEPH** (b. 1876). British writer on music. Born July 16, 1876, he was edu-

cated at Eton and King's College, Cambridge. Professor of music at Cambridge, 1926-41, he was one of the founders of the International Society for Contemporary Music. One of the foremost musical critics, his translations of opera libretti, *The Marriage of Figaro*, *Così fan Tutte*, *Don Giovanni*, *The Barber of Seville*, *Der Rosenkavalier*, etc., for Sadler's Wells Theatre, were distinguished for their scholarly yet easy and natural language as compared with the stilted and careless versions of the older translators. His publications include *Scarlati*, 1905; *Mozart's Operas*, 1913; *Foundations of English Opera*, 1928; *Life of Handel*, 1934; *Opera*, 1940; *A Theatre for Everybody*, 1945.

**Dent, J. M., & Sons.** London firm of publishers founded by Joseph Malaby Dent (1849-1926), with printing and binding works at Letchworth, Herts. They are publishers of the reprints known as *Everyman's Library*, started in 1906 under the editorship of Ernest Rhys.

**Dental** (Lat. *dens*, tooth). Name usually given to a sound formed or articulated by contact of the edge of the tongue with the teeth or their sockets (*alveoli*); such are *t*, *d*, *th* (in *thin* or *this*), *n*, *l*. The term is not strictly correct, since in the production of some sounds the tongue is not really brought against the teeth, which have little to do with the articulation. Hence various names have been given to these letters—point (*t*, *d*, *n*), lateral (*l*)—which again have been classified as inter-dental, post-dental, and alveolar. See *Phonetics*.

**Dental Cement.** Material for filling the cavities in decayed teeth. It is generally composed of a powder and a liquid which, when mixed together, react chemically to form a hard cement. Oxy-phosphate cement consists of a powder—zinc oxide—and a liquid—phosphoric acid. Oxy-chloride cement has zinc oxide as the powder and saturated zinc chloride solution as the liquid. Silicate cements have finely powdered quartz and kaolin as the basis. The powder and liquid are mixed to a paste just before placing the cement in the hollow tooth. See *Dentistry*.

**Dentalium** OR ELEPHANT'S TOOTH SHELL. Genus of marine mollusca. They have the shell in the form of a tube open at both ends and wider at one extremity than the other. Three species, each about 1½ ins. long, are found around the British coasts, especially off the N. of Scotland.

**Dentatus**, MANIUS CURIUS (3rd cent. B.C.). A Roman magistrate. He was consul in 290, 275, and 274, gained several victories over Samnites, Sabines, and other Italian tribes, and finally defeated Pyrrhus at Beneventum (275). Simple-minded, unselfish, and incorruptible, he consistently refused to enrich himself personally, and spent his closing years in the cultivation of his small farm.

**Dent Blanche** (Fr., white tooth). A peak of the Pennine Alps, W. of the Matterhorn and near Zermatt, Switzerland. It was first ascended by T. S. Kennedy and W. Wigram in 1862. Ascents, some of which are difficult, are made from Zinal, Ferpècle, Arolla, or Zermatt. Its height is 14,318 ft.

**Dent du Midi.** Mt. group of Valais, Switzerland. An outlier of the Pennine Alps (*q.v.*) between the Val d'Illiez and the Rhône, its highest point is Haute Cime, 10,696 ft. Other peaks are Dent Noire, 10,434 ft.; Dent Jaune, 10,457 ft.; and Cathédrale, 10,386 ft. It holds several glaciers, the largest being the Plan-Névé. The Haute Cime, ascended from Champéry, commands an imposing view of Mt. Blanc, the Alps of Valais and Berne, and of parts of the lake of Geneva. See *Chillon illus.*

**Dentil** (Lat. *denticulus*, little tooth). Small block of wood or stone, used as a repeating ornament in the hollow of a cornice (*q.v.*). A dentil-band is a style of cornice-moulding formed of a row

of dentils with the interstices partially or completely filled up. Another form of the word is *denticle*. See *Console*; *Corbel*; *Moulding*.

**Dentine.** Material which surrounds the central pulp of a tooth and lies beneath the enamel or hard outer covering. See *Teeth*.

**Dentist.** Practitioner of the branch of surgery which deals with the conservation and extraction of teeth and the adaptation of artificial teeth. No one may practise dentistry unless he is a registered dentist or is a doctor, except that a registered chemist may in emergency extract a tooth without any general or local anaesthetic, and in any public dental service any dental work may be carried out by an unqualified person under the direct supervision of a registered dentist. The register, which was instituted by an Act of 1878, is kept by the Dental Board.

The preliminary examinations recognized by the General Medical Council for admission to the register are the same as for medical students, and are of the university matriculation standard. The most generally favoured qualifications are those of the Royal College of Surgeons in England, the Royal College of Surgeons of Edinburgh, the Royal Faculty of Physicians and Surgeons of Glasgow, and the Royal College of Surgeons in Ireland. Licentiates of these faculties use the letters L.D.S. after their names.

## DENTISTRY: THE CARE OF THE TEETH

J. SIM WALLACE, M.D., D.Sc., L.D.S.

*With this article, which is preceded by one on the qualifications of a dentist and followed by one on dentition, should be read that on Teeth. See also Anaesthesia; Caries, etc.*

Dentistry may be said to have begun with civilization in Egypt. From the Ebers Papyri we gather that dental diseases such as gum-boils and painful erosions of the teeth were described, and some sort of medical treatment such as plasters and decoctions was advocated (4700-1000 B.C.). Similar knowledge was possessed by the Greeks, and from Aristotle (4th cent. B.C.) we learn that instruments for extracting and scaling the teeth were used. In Italy we find the first definite knowledge of mechanical or prosthetic dentistry. The Etruscans, 500-400 B.C., evidently restored missing teeth, for specimens of bridge-work have been discovered and preserved in the Corneto museum. These bridges were of a primitive kind, but inasmuch as the artificial substitutes were attached to the

neighbouring teeth with wire or gold bands, the essential principle of modern dental bridge work was recognized.

The Romans practised dentistry extensively, and modest fortunes could be made at this art in those days. Celsus writes at some length on the diseases of the teeth, and in describing the procedure for the extraction of a tooth advocates the filling of a hollow tooth with lead before it is removed. Filling the teeth for their preservation is not recommended until A.D. 850, when Rhazés, a Persian, advocated this now familiar operation. With the decline and fall of the Roman empire the art of dentistry in Europe appears to have become more or less extinct, but in N. Africa, the Arabians continued to practise it. With the Renaissance it revived, and towards the end of

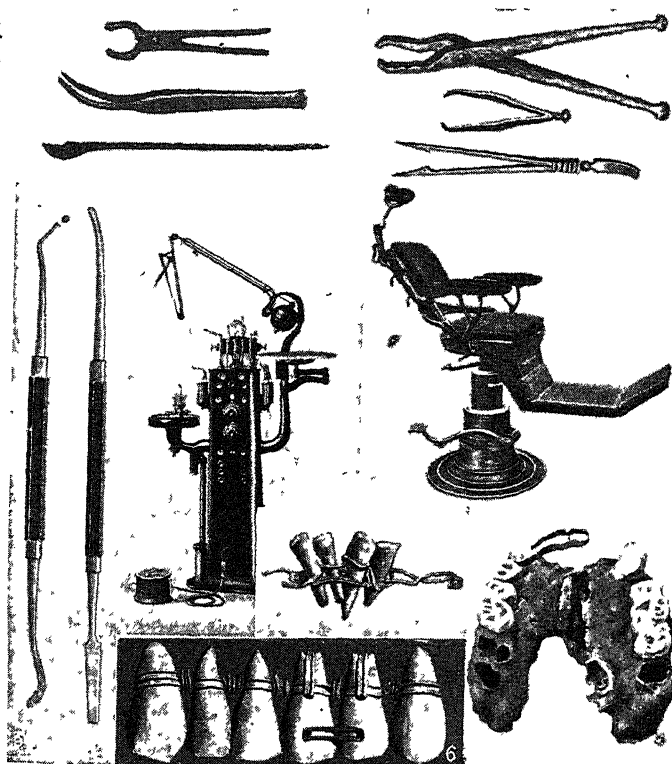
the 15th century Giovanni d'Arcoli advocated the use of gold foil for filling teeth. It may be noted that Peter van Foreest in 1580 attributes harmful effects to the eating of sweets. In 1595 there is evidence that something like a gold-capped or other kind of gold crown had been made, as a boy with a gold tooth was exhibited.

In 1678 Anton van Leeuwenhoek (*q.v.*), the naturalist, constructed a powerful microscope, by the aid of which he laid the foundation of modern knowledge with regard to the minute anatomy of the teeth. The 18th century showed very marked progress. In 1700 Andry of Paris called attention to micro-organisms in the white matter surrounding the teeth. In 1728 Fauchard published his *Chirurgien Dentiste*. He advocated specialised training and may be said to have laid the foundations of the art of modern dentistry. He made important contributions to the art of dentistry, advocating the bow and drill—the earliest type of the modern dental engine—and conceived the idea of enamel teeth to take the place of the human or carved ivory teeth, which had hitherto been used as artificial substitutes. Later, in 1746, he advocated the principle of suction for the retention of upper dentures.

#### The Work of Hunter

In Britain dentistry advanced in quite another way. John Hunter published *The Natural History of the Human Teeth*, 2 vols., 1771–78. The anatomical and pathological specimens of the teeth which he prepared remain the admiration of those who visit his collection in the Royal College of Surgeons of England, and his work and knowledge form the basis of modern scientific dentistry. In regard to the hereditary nature of disease Hunter outlined the argument more fully developed later by Weismann, that acquired characters are not inherited. This was the doctrine which in the first years of the 20th century led more than any other to the discovery of the cause of the prevalence of dental caries and other dental diseases. In 1800 Humphry Davy discovered the anaesthetic effect of nitrous oxide gas, which is still the chief anaesthetic in dental surgery. Today, however, local anaesthetics such as novocain are also used for the extraction of teeth and for minor dental operations.

In the 19th century advances in the study of teeth and dentistry in Great Britain were made by various medical men, notably Richard Owen and John Tomes,



Dentistry. 1. Ancient Greek dental instruments. 2. Roman forceps and other appliances. 3. Modern instruments used for plastic fillings. 4. Operating equipment. 5. Operating chair controlled by automatic clutches. 6. Artificial teeth excavated at Saidon, probably Egyptian. 7. Ancient Greek artificial denture. 8. Etruscan dental appliance

but the greatest progress in the art of dentistry took place in the U.S.A. Based on the works of Fauchard and other European pioneers, inventive ingenuity introduced many delicate dental instruments and new means of doing more skilful and better work. The use of vulcanised rubber for artificial plates, the dental engine, and the use of the rubber dam for the exclusion of moisture during operations may be noted.

#### Introduction of Anaesthesia

To Wells and Morton, two American dentists, we are indebted for the introduction of anaesthesia for dental and surgical operations.

Dentistry itself also became specialised into different branches, such as mechanical and surgical dentistry, and orthodontics, the science devoted to the malposition of the teeth, which has specially benefited by the finely made appliances, the credit for which largely belongs to the manufacturers. In 1839 the first dental journal, *The American Journal of Dental Science*, was published, and this was soon followed by others both in America and in Europe.

With regard to dental science,

more strictly so called, the names of W. D. Miller and G. V. Black should be noted, the former for his important work (written in German) on *Micro Organisms of the Human Mouth* (1889), and his excellent contributions on the pathology of dental caries. Although Black made many other useful studies, his outstanding work was *An Investigation into the Chemical and Physical Characters of the Teeth*, publ. in *The Dental Cosmos* (the leading American dental journal), vol. xxxvii, May–Sept., 1895. Notwithstanding all the progress of the 19th century, it had to be admitted that knowledge of the causation and prevention of dental diseases was still meagre. Nevertheless, the first decade of the 20th century surveyed this field more or less completely.

It has been demonstrated that the inherent structure of teeth of the civilized is no more degenerate or hereditarily predisposed to dental diseases than it was thousands of years ago when dental diseases were relatively rare. With regard to the causation of the irregularities of the teeth, the following points have been elucidated. The instinct

to gnaw must be regarded as the primary means of adapting the lower teeth to the upper teeth in correct relationship; interference with the child's instinct to gnaw prevents correct adaptation. This may result either from mouth-breathing or from withholding articles which might be gnawed by the child. A general cause of crowding is emaciation, including emaciation of the tongue round which the dental arches are moulded. This results usually from persistent disregard of the hygiene of the mouth and alimentary canal. Malposition can also result from persistent thumb-sucking.

Crowding due to somewhat imperfect development of the jaws is also made likely by the withholding from the child with teeth of food which would stimulate mastication. The most common cause of marked irregularities of the teeth, however, is habitual mouth-breathing, brought on as a rule by continuous or frequent infection of the mucous membranes of the nasal breathway where such mucous membrane has had its vitality reduced by cold and damp air.

#### Causes of Dental Caries

The leading points noted with regard to the causation of dental caries are that the relative tendency of sugary and starchy foods to lodge unduly varies, according to the form in which they are taken, their concentration, and their combination with other articles of diet. Thus they may be soft, bland, and adhesive so that they favour caries; or, on the other hand, they may not be adhesive, but may stimulate mastication and the self-cleansing processes of the mouth.

Furthermore, such food as lodges in the crevices of, or between, the teeth may be impermeable to the saliva, whose function it is to a large extent to prevent foodstuffs harming the teeth. The food which lodges may also be impermeable by the acids formed by the bacteria adhering to the enamel in the crevices of the teeth. The fact that children who lived in sugar-cane plantations, and were much addicted to eating sugar-cane, had remarkably good teeth, was for a long time regarded as conclusive evidence that the once popular theory that sugar was harmful was erroneous. But in the light of present-day knowledge, this fact in no way invalidates the idea that sweets as usually con-

sumed in civilized countries tend to be harmful.

Pyorrhoea alveolaris is not essentially different in its causation from dental caries; but in pyorrhoea the stagnation at the crevice formed by the tooth and the gum must be complete, and not periodical as in caries, and starchy and sugary food, where it lodges, is rather inimical to the alkalinity which favours the formation of tartar. The natural method of preventing pyorrhoea is the stimulating of efficient mastication of firm or fibrous food, acid in itself, which not only helps the mechanical cleaning of the mouth but also precipitates and disintegrates the mucous coating which, if it at places stagnates, favours the deposition of tartar. (See Pyorrhoea.) Damage to the protective dental enamel by too harsh cleaning also opens the way to infection.

Chemical experiments have shown the necessity of a well-balanced diet in the maintenance of healthy teeth. Particularly essential is the inclusion of sufficient foodstuffs providing calcium and vitamin D in the diets of both children and expectant mothers. The administration of calcium in tablet form is frequently required; though it cannot cure, it may prevent the spread of caries. But the science of dietetics, more especially with regard to the feeding of children, has been shown to require considerable reformation, while the estimation of the value of foodstuffs solely from nutritive and caloric values is often unsatisfactory and misleading. Today, the fact that the hygiene of the mouth is most important for general bodily welfare is widely appreciated. Moreover, medical officers of health and school doctors throughout the country have already taken steps to cope with dental troubles, some by instituting school clinics for treatment, others by inculcating preventive measures which are more permanently beneficial and involve little expense.

#### Oral Hygiene and Preventive Medicine

The influence of the teachings of the dental profession on the science of physiology is so far not great. Yet it has been claimed, no doubt with truth, that when physiologists recognize and teach medical students the functions of the mucous and salivary glands in the light for which they are indebted to the dental profession, the decrease in diseases of the teeth and concomitant and consequent diseases will then consti-

tute the greatest triumph of preventive medicine.

As the state recognizes its duty to prevent disease, the duties of the medical officer of health include the following: "He shall inquire into and ascertain by such means as are at his disposal the causes, origin, and distribution of diseases within his district, and ascertain to what extent the same have depended on conditions capable of removal or mitigation."

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**Dentition.** Arrangement of the teeth in animals. Teeth, homologous throughout the series, are present in almost all divisions of the vertebrates, from the fishes upwards, with the exception of the modern birds. The invertebrates have no true teeth, the notched jaw processes in some arthropods, which serve the purpose of dividing or grinding food, being structurally quite different.

In the fishes, teeth are usually present in large numbers, and are not confined to the jaws, but occur in some forms throughout the body. They are the most primitive scales. Unlike mammalian teeth, they are all of more or less uniform character. When worn out, they are replaced by others and not by growth from beneath. They may be either of pointed form or consist of rounded plates.

In the amphibians the teeth are fewer in number. In these and most reptiles they are fixed to the bones of the jaw. The fangs of venomous snakes are loosely attached, and can be folded back when not in use. No existing species of birds possesses teeth, but they are present in certain fossil types. The notches in the beaks of some birds are not teeth. The mammalia exhibit teeth of divergent types specialised to suit different kinds of diet; and many genera are classified according to their dentition, teeth being well preserved in fossils.

The total number of teeth possible in most mammals is 44, 11 on either side in each jaw, consisting of three incisors, one canine, four premolars and three molars. This

is usually expressed briefly in a dental formula, thus  $\frac{3113}{3113}$ . But the full typical number is rarely found, and the dentition of the Marsupials, the false group called the Edentates, and Cetaceans departs widely from the type and cannot be reduced to such a regular dental formula. The following formulae indicate the diversity of dentition in various genera: Man  $\frac{3113}{3113}$ , Old World monkey  $\frac{3113}{3113}$ , dog  $\frac{3113}{3113}$ , cat  $\frac{3111}{3111}$ , horse  $\frac{3113}{3113}$ , sheep  $\frac{8013}{8133}$ , opossum  $\frac{5114}{5114}$ . See Teeth.

**Denton.** Urban dist. and market town of Lancashire, England. It is 6 m. S.E. of Manchester, with a rly. station. Felt hat making is the chief industry. Two large reservoirs here form part of Manchester's water supply. Market day, Fri. Pop. 23,500.

**D'Entrecasteaux.** Group of islands off the E. end of New Guinea (territory of Papua), belonging to the Australian Commonwealth. The chief are Ferguson, Normanby, and Goodenough, with several islets; total area, 1,084 sq. m. Of volcanic origin, they are mountainous, rising to some 7,000 ft.; there are volcanoes and hot springs. Tin and some gold are found. They are named after Bruni D'Entrecasteaux, the French explorer, who discovered them (1792).

**Dentz, HENRI** (d. 1945). French soldier and administrator. He was military governor of Paris when the German army marched in on June 14, 1940. French high commissioner in Syria from Dec. 7, 1940, he sued on July 11, 1941, for cessation of hostilities in Syria between Vichy and Allied forces. Failing to surrender under the armistice terms 75 British and Indian officers, Dentz and other Vichy officers were interned on Aug. 7. He was soon released,

and returned to France, where on April 17, 1945, he was put on trial as one of the Vichy collaborators. He was condemned to death, but on Oct. 24 the sentence was commuted to life imprisonment. Dentz died on Dec. 13.

**Denudation** (Lat. *denudare*, to make bare). Process by which the earth's surface is being sculptured, its general level lowered, and the materials produced by this sculpturing and lowering carried away. Evidences of denudation are widespread. Isolated pyramid of tabular shaped mountains composed of horizontal sedimentary strata, must long ago have been parts of plateaux. The floor of the continental margins of the ocean is littered with deposits brought from the lands. Granite is a rock of deep-seated origin, so that great denudation has taken place wherever it is now found at the surface. The agents of denudation are weathering (*q.v.*) and erosion (*q.v.*).

**Denver.** Capital of Colorado, U.S.A., and coterminous with Denver co. The administrative and commercial centre of the Rocky Mt. state is on the S. Platte river, E. of the base of the main range of Rockies, a mile above sea level, with no larger city for 500 m. in any direction. It is served by rlys., and has 300 mountain parks connected by 100 m. of boulevard. It is the emporium for the gold, silver, and coal mining districts of Colorado, has smelting works, refineries, foundries, machine shops, and flour mills, and makes wagons, harness, leather goods, and rubber goods. Denver has the biggest cattle market in the West.

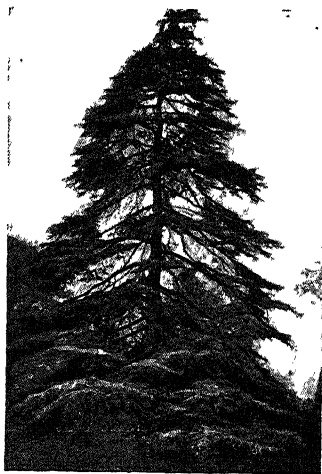
There are some 200 federal bureaux and a coinage mint. There is an R.C. cathedral. Educational institutions include the university of Denver (1864) and the medical school of the university of Colorado. The state capitol is of native granite with a dome finished in gold. An Athenian civic centre contains the chief administrative buildings; local government is by a mayor and council. Settled in 1857, the city and co. received a fresh charter in 1904. Magnificent views of the Rockies, a low humidity, and plentiful sunshine help to make it a tourist centre. Pop. 322,412.

**Denza, LUIGI** (1846-1922). Italian composer. In 1876 he produced his opera *Wallenstein*. The most famous of his songs was *Funiculi, Funicula*, composed in 1880 on the opening of the

funicular rly. up Mt. Vesuvius. He died Jan. 26, 1922.

**Deodand** (Lat. *Deo dandum*, to be given to God). In English law, an animal or article that, having caused the death of a human being, was forfeited to the king. The article or animal was forfeited to God, or to the gods, but in England this came to mean the crown. A horse, or wagon, or knife could be deodand. Lawyers drew a distinction between deaths caused when the article was at rest and deaths caused when it was in motion. In the former case only the part held responsible for the accident, *e.g.* the wheel, was deodand, but in the latter case the whole was. The practice was abolished by 9 and 10 Vict. c. 62 in 1846.

**Deodar** (*Cedrus deodara*). Evergreen tree of the family Coniferae. It is a native of the W. Himalayas.



Deodar. Example of the *Cedrus deodara* of the Himalaya Mountains

Similar in most points to the Cedar of Lebanon—of which some authorities say it is a geographical form—it differs in its more pyramidal outline, its longer leaves, and the more pendulous habit of its leading shoots and branchlets. It attains a height of from 150 ft. to 200 ft.

**Deodoriser** (Lat. *de*, away; *odor*, smell). Substance which masks offensive smells. The more important are formaldehyde, peroxide of hydrogen, volatile oils, camphor, turpentine, naphthalene, carbolic acid, chloride of zinc, potassium permanganate, charcoal. They are distinct from disinfectants, which destroy the cause of the smell.

**Deogarh.** Town of India, in the state of Bihar. Containing a famous group of temples



Denver, Colorado. View looking up Seventeenth Street, one of the principal thoroughfares of the city



dedicated to Siva, it is a centre of Hindu pilgrimage. Another Deogarh was the capital of the former Bamra state, now in Orissa, and there is a third in Udaipur, Greater Rajasthan.

**Deoxidation.** Chemical operation involving the removal of oxygen from a compound. More commonly known as reduction, it is the chemical reverse of oxidation. The deoxidising agent may be the luminous tip of the Bunsen flame, or charcoal, or other chemical means. *See* Chemistry; Oxygen.

**Department** (Fr. *départir*, to divide). Word used in France for the areas into which the country has been divided since the Revolution. At first 83, their number was afterwards increased, and in 1939 there were 90. Three departments were created when Savoy and Nice were annexed in 1860, while three others, Bas-Rhin, Haut-Rhin, and Moselle (Alsace-Lorraine), were lost to France between 1871 and 1919, and then recovered. Most departments are named after their chief river or rivers, e.g. Seine, Loire, Cher, Lot, Garonne, etc.; a few after some other physical feature, e.g. Côtes du Nord, Pas-de-Calais. Each department is governed by a prefect, assisted by a council, and is divided into *arrondissements*. In 1947 the French colonies of Guadeloupe, Guiana, Martinique, and Réunion were given the status of departments of the mother country.

Finland, Greece, Italy, and several South American countries are divided into departments.

**Departure, ANGLE OF.** Term in ballistics to denote the angle which the line of departure of a projectile makes with the line of sight, or horizontal plane. The prolongation of the line of departure is the actual path of the projectile after it has left the muzzle, and is known as the trajectory.

**Depew, CHAUNCEY MITCHELL** (1834-1928). American lawyer and orator. Born at Peekskill, N.Y., April 23, 1834,

after graduating at Yale he was called to the N.Y. bar, 1858. Prominent in state politics, attorney to numerous rlys., and from 1898 chairman of the whole Vanderbilt system, during 1899-1911 he represented N.Y. in the senate. He was



Chauncey Depew,  
American lawyer  
Elliott & Fry

the chosen orator on many national occasions, notably on the unveiling of the statue of Liberty in N.Y. harbour, 1886, and at the Chicago World's Fair, 1892. He died April 4, 1928. Orations, Addresses, and Speeches were edited by J. D. Champlin, 8 vols., 1910.

**Dephlegmation.** Process of removing water from alcohol to increase its strength. Formerly this was accomplished by shaking the alcohol with quicklime or potassium carbonate, these agents having the power of absorbing water. The term is now applied to the process in which the rectifying column of stills is used in preparing alcohol. The dephlegmator separates the "phlegma," or watery portion, from the alcohol, owing to the differences in the boiling points of alcohol and water. *See* Alcohol.

**Depilatory** (Lat. *depilare*, to pull out hair). Preparation for removing hair from parts of the body where it is not wanted. The basic preparation is barium sulphide, 5.0; prepared chalk, 10.0; made into a thin paste with water and applied. The hair will grow again, but the treatment can be repeated. Contrary to popular belief, hair thus treated becomes in time weakened and tends to disappear. Hair is also discouraged by the use of hydrogen peroxide which weakens and bleaches it, thus rendering it less apparent. Electrolysis often represents the best attack. The cure for really abnormal hair growth on the chin and cheeks of women is the surgical removal of part of the adrenal glands, which lie above the kidneys.

**Dépit Amoureux** (Lovers' Quarrels). Five-act comedy by Molière. It was first produced at Béziers, 1656, the scene being laid in Paris. The part of Albert was acted by Molière.

**Deploy** (Fr. *déployer*, to unroll). Military term meaning to extend a body of troops from close formation to a line of small depth in open order. In actual combat, deploy is a section movement, but strategically the term refers to the movements of armies from a central base to one or more theatres of operations. In the Second Great War, Allied armies based in Britain were deployed to fronts in Africa, the Far East, and the continent of Europe. *See* Tactics.

**Depolariser.** Material added to the solution in a voltaic cell to counteract the effect of polarisation, i.e. of counter electro-motive force due to the accumulation of hydrogen on the negative plates

and to other causes. The material varies with different types of cell and consists of an oxidising solution or a solid, e.g. a solution of chromic acid may be used for a Bunsen cell or powdered manganese dioxide for a Leclanché cell.

**Deponere** (Lat. *deponere*, to lay aside). In Latin grammar, term incorrectly applied to a class of verbs, the form of which is passive, but the meaning active; such are *vescor*, I eat; *aversor*, I turn away. In reality, these are middle or reflexive verbs, *vescor* meaning I feed myself, *aversor*, I turn myself away. When this middle form (expressing the action of the subject upon itself) came to be used for the passive (expressing that the subject is acted upon by someone or something else), it was said that such verbs as *vescor* "laid aside" the passive meaning which in reality they never had.

**Deportation** (Lat. *de*, from; *portare*, to carry). Term meaning to remove anyone forcibly from a country, used mainly in connexion with aliens (*q.v.*). Where an alien is convicted of an offence, a magistrate or judge may recommend him, after being punished, to be deported as an undesirable alien. Orders for deportation are made by the Home office.

**Deposit** (Lat. *deponere*, something put down). In English law, one of the forms of bailment. It arises where goods are deposited with a bailee to be kept for the bailor without payment. The depositary is said to be liable only for damages to or loss of the goods by gross negligence. Deposit is also used in English law to mean a sum of money paid to a person, generally the vendor of real estate, as security that the contract shall be carried out. *See* Bailment.

**Deposition.** Process by which rock waste is accumulated either on dry land or on the bed of a lake or ocean. On the land, deposition is largely confined to the lower levels, where rivers in times of flood gradually build up plains from the sediment which they carry. Rivers flowing into tideless or almost tideless seas drop the sediment they carry in suspension, and often build extensive deltas, e.g. the Mississippi, Nile, Rhine, and Ganges. But it is on the ocean floor, along the continental margins, that the most extensive deposition takes place, the layers of sediment there built up often attaining great thickness. The pressure of the upper layers, together with the cementing of the grains by mineral matter brought by water which slowly finds its way

through the whole mass, gradually alters the lower layers into hard sedimentary rocks, so called because they have been built up of particles which have settled down. Uplift may once again raise the layers above sea level. See Coast; Denudation.

**Deposition.** Term used in English law for the official record of evidence given verbally before a court or an officer thereof, and intended for use thereafter.

**Depot** (Fr. *dépôt*). Building or site where supplies are stored, especially food, medical stores, ammunition, or vehicles for military purposes, e.g. supply depot, ordnance depot. In war, depots are formed at the places of embarkation, or other bases of operations, and at points along the line of communication from base to front. The term is also applied to the barracks where in time of peace recruits receive their first training, where soldiers take their discharges, and where reservists join on mobilisation. In the U.K. each regiment and arm of the service has its own depot, the location of which is shown in the Army List.

**Depot Ship.** Originally a floating barracks to accommodate naval ratings awaiting drafting to the fighting ships of the fleet. Nowadays the term is more commonly applied to the store and workshop ships equipped to repair, munition, and store submarines and destroyers. The depot ship also provides recreational facilities for the flotilla crews. Units of the Royal Navy operating in the Pacific during the Second Great War were served by a variety of depot ships known as the Fleet Train (*q.v.*).

**Depreciation** (Lat. *de*, down; *pretium*, price). Term used, chiefly in a commercial sense, for a fall in the value of anything, such as securities, precious metals, and other commodities. It is also used for the decline in the value of machinery, buildings, and other business assets due to wear and tear, and sometimes to special causes, such as a new invention which renders certain machinery obsolete. Every business should make an adequate allowance for depreciation before arriving at its net profit. The percentage to be set aside for depreciation varies according to the nature of the firm's assets.

**Depressed Area, or DISTRESSED AREA.** District in which many of the employable inhabitants have either never been employed or have remained unemployed over

a long period. A world-wide period of industrial depression began in the U.S.A. in 1929, reaching its culminating point in Great Britain during 1931-32. The principal depressed areas were Cumberland, Durham and Tyndeside, South Wales, and Scotland; the Rhondda Valley had 281 people in every 1,000 unemployed for more than a year.

In 1934 Government investigators in these districts recommended industrial and labour transfer, land settlement, and public works schemes. Under the Special Areas Act, Nov., 1934, these became officially Special Areas; two commissions were appointed to implement the government's plans, and a £2,000,000 fund for the purpose was established. The commissioners had power to acquire land compulsorily for holdings for the unemployed, develop occupational centres, and acquire derelict sites for new industries. A scheme for cottage homesteads for elderly unemployed men with families of adolescents living in special areas was approved in Dec., 1936; each homestead consisted of a detached house and half an acre of land. The Distribution of Industry Act, June, 1946, authorised the government to offer inducements to industrialists to establish new industries in these areas, renamed Development Areas. See Trading Estates.

**Depressed Classes.** Officially known as scheduled castes, the depressed classes in India were also called untouchables because contact with them (even only by shadow in some parts of India) was pollution for the Brahmin. Out of the 260 million Hindus in India, about 50 million were outside the four main castes: Brahmin (priest), Kshattriya (soldier), Vaisya or Bania (trader), Sudra (artisan). Members of the scheduled castes included sweepers, washermen, workers in leather, dancing girls, etc. Like the caste Hindus, they remained at death in the lot in which they were born. They could not enter the temples, attend the schools, or draw water from the wells used by the caste Hindus. The British government, Christian missionaries, and reforming Indian organizations worked long to remove these disabilities. In British India, no school with a government grant could exclude pupils from the scheduled castes. Industrialisation and increased communications mitigated their hardships in the large cities. Bombay, Oct., 1946, and Madras, Feb.,

1947, removed the disabilities of the depressed classes. The 1950 constitution embodied the constituent assembly's enactment of 1948 which had abolished untouchability in any form.

**Depression.** In meteorology, a system of closed isobars. At the centre, the barometer is lower than in the surrounding parts, the isobars enclosing the "low" being more or less circular or oval. As in a cyclone, the surface winds blow counter-clockwise round the centre in the N. hemisphere, bending in towards the low pressure region. The wind direction is reversed in the S. hemisphere. Depressions may be 1,000 m. in diameter: some may be deep (large pressure gradients), and some shallow (small pressure gradients). In the middle latitudes depressions generally move in an E. or N.E. direction, the rate of travel varying from hundreds of miles in a day to virtually nil.

Formerly it was believed that depressions were due to local heating at the centre, resulting in a rise of warm air with a reduction in weight and therefore of pressure at the base. The wind circulation followed. It has since been shown that in the free upper air depressions tend to be cold rather than warm, and that in a well-marked surface depression pressure "lows" also occur 5 m. up, i.e. in the lower part of the stratosphere.

Present day theories attribute the formation of a depression to interaction between warm and cold air masses. This is based on the fact that depressions originate in a comparatively straight front separating the cold air from the warm air. In the simplest case the warm air, flowing in a direction opposite to that of the cold air, climbs over the colder air ahead along a gently sloping surface, termed the "warm front" of the depression. At the same time the cold air in the rear undercuts the warm air, hence the "cold front." As the bulge of warm air grows, the pressure falls at the apex of the bulge. Now the cold front moves forward more rapidly than the warm front and eventually overtakes it, pushing the remaining warm air off the ground. The depression is then said to be "occluded" and decay sets in, completing the life-cycle.

The rainfall, a feature of depressions, is confined chiefly to the regions along the fronts. As the warm front approaches, cirrostratus, altostratus, nimbostratus is the sequence of observed cloud



types. The sky has a dirty look and the sun is blurred. Precipitation gradually increases as the cloud base lowers, and eventually becomes continuous and steady until the front has passed. The rain belt at the ground may extend for 200 m. in advance of the warm front. On the other hand, the passage of the cold front is not so easily distinguishable by cloud observation. Owing to instability in the air above, cumulonimbus clouds develop, often producing thunderstorms, heavy rain, or hail showers. The low cloud and rain are, however, confined to narrow belts of 20-30 m. across. In extreme cases the front arrives in a line-squall. *See* Cyclone; Meteorology; Weather; Wind.

**A. J. Drummond, F.R.Met.S.**  
**Depretis**, AGOSTINO (1813-87). Italian statesman. Born Jan. 31, 1813, as a young man he fell under the influence of Mazzini and became a member of Young Italy. In 1848 he was elected deputy for the party of the Left. He opposed Cavour and voted against the entry of Piedmont into the Crimean War. Later he became reconciled to Cavour, who in 1860 sent him to Sicily to counteract the extremist policy of Garibaldi. He entered the government in 1862 as minister of public works, and in 1866 became minister of marine, in which position he incurred much of the blame for the defeat of Lissa. In 1873 he became leader of the Left, in 1876 prime minister, and, with an interval of thirty months, directed the entire policy of Italy until his death, July 29, 1887.

**Deprived Children.** *See* Homeless Children.

**De Profundis** (Lat., out of the depths). Opening words of Psalm 130. One of the 15 gradual psalms, or "songs of degrees," of the Jewish pilgrims to Jerusalem, it was from the earliest times a penitential psalm throughout the Christian Church. It is recited by Roman Catholics as a prayer for the dead, and at funerals, and in the daily office for Wednesday. In the Church of England it is one of the psalms for Ash Wednesday. Oscar Wilde's apologia with this title, written in prison, was pub. in full only in 1949.

**Deptford.** One of the 28 London boroughs. It is on the W. side of Greenwich, with which it is closely associated, the older part of Deptford being in the latter borough. Formerly it had a dockyard, where Raleigh docked his Golden Hind, and where Peter the Great studied navigation; and

here was Sayes Court, some time the home of Evelyn, the diarist. Here are the Royal Army Victualling Yard, the Goldsmiths' College, the Haberdashers' girls' and boys' schools, and S. Nicholas' church, where Marlowe, the poet, was buried, and where may



Deptford arms

be found specimens of Grinling Gibbons's carvings. The church was badly damaged by fire bombs during the Second Great War. On Nov. 25, 1944, a German rocket fell on a store in New Cross Road, killing 149 and injuring 299, probably the worst single air raid incident of the war. Deptford returns one M.P. Pop. 106,891.

**Depth Charge.** An anti-submarine weapon evolved by the mine design dept. of the British Admiralty for use by the Royal Navy in the First Great War. The standard type consists of a thin-walled, metallic, drum-like case filled with 300 lb. of amatol. Through the centre runs a tube containing a tetryl priming and the firing mechanism. The latter includes a hydrostatic valve, which can be set to operate the fuse and ignite the charge at practically any prearranged depth of water. When the set depth is reached, the increased pressure of the water upon a diaphragm in the valve releases a spring and causes the detonator to operate.

Depth charges are either dropped overboard from a rack at the stern of the vessel, or discharged from a double mortar called the Y-gun, which can project charges on either side of the ship for a distance of 150 yds. When anti-submarine vessels carry out a concerted attack on a submerged submarine, the charges are dropped in a pattern over the sea, set to explode at various depths. The minimum depth is always somewhat below that to which the submarine is estimated to have dived; the effect of an explosion below a submarine being more violent than one above it.

Towards the close of the Second Great War the Royal Navy developed a depth charge weighing a ton and fired from the torpedo-tube of a destroyer. A new projector, known as the hedgehog, was also put into service: it resembled a huge mortar and was capable of throwing 24 charges to a distance of 200 yds. ahead of the ship. Charges thrown by the hedgehog exploded only on contact with a submarine, but, owing to the terrific power of torpex, the explosive with which they were filled, their effect was lethal.

When employed by high speed vessels, such as destroyers, the depth charge was the most potent anti-submarine weapon. The under-water explosion was so powerful that a submarine in the immediate vicinity was almost certainly destroyed. Even at a distance the concussion strained plates or damaged the controls sufficiently to compel the submarine to surface, where it fell an easy prey to gunfire. Any vessel dropping depth charges had to be moving at a speed that enabled it to be some distance away before the concussion was felt.

Ordinary depth charges were carried under the wings of Catalina flying-boats and other aircraft of the R.A.F. and Fleet Air Arm operating anti-submarine patrols. They were dropped on submerged submarines in the same manner as bombs. *See* Hedgehog.

**Deputy** (Lat. *deputare*, to prune, late Lat., to select). Strictly speaking, an authorised agent. A general deputy is empowered to perform the whole of another's office; a special deputy, a particular part. In the U.K., recorders, county court judges, and registrars, returning officers, and some other public officials are allowed to



Depth Charge. Mechanical thrower for hurling a depth charge (seen in position) well clear of the ship

appoint deputies. The word is also used of a member of a representative assembly, e.g. the French chamber of deputies. The deputy of a coal mine is an officer who tests the timbering and ventilation and generally looks after the safety of the miners. The manager of a common lodging-house is known as the deputy.

**De Quincey, THOMAS** (1785–1859). British author. Born at Manchester. Aug. 15, 1785, son of a linen merchant, his early days were spent in the rural suburb of Greenhay. Shy, delicate, impressionable, and dreamy as a child, his earliest recollections were of the death of his sister Elizabeth when he was five, followed by his father's death a year or two later, and of a dream about a favourite nurse. Educated at a day school at Salford, and at grammar schools at Bath, Winkfield (Wilts), and Manchester, he displayed an extraordinary proficiency in Greek. In July, 1801, he ran away from Manchester, and, with an allowance of a guinea a week, wandered about the mountains of N. Wales. Then, forfeiting his allowance, he made his way to London, slept in an empty house in Greek Street, Soho, and met in Oxford Street the Ann of his Confessions, who spent her last sixpence on a glass of wine to revive him from a fainting fit, one result of his hardships being an aggravation of his inherited tendency to an internal trouble which led him later to the opium habit.

#### Student and Essayist

Reconciled to his relatives in 1803, he matriculated at Worcester College, Oxford, where for four years he pursued his studies in Greek and Latin, English literature and German metaphysics. After he had passed a remarkably good written examination, he left the university without taking a degree. Profoundly influenced by Coleridge, to whom he sent anonymously £300 as an unconditional gift, and by Wordsworth, he became an intimate member of the Lake school. For nearly 20 years from 1809, when Wordsworth left it, he made Dove Cottage, Grasmere, his headquarters.

Three years after his marriage to Margaret Simpson, daughter of a salesman, by whom he had three daughters and five sons, his patrimony of £150 a year was seriously diminished, and from that time until his death he was an indefatigable contributor to magazines—to The London, to which Talfourd introduced him; to Blackwood's, his sponsor in this case being John Wilson (Christopher North); to

Tait's, and others. In 1819–20 he was editor of The Westmorland Gazette. In 1828 he took up his residence in Edinburgh, whence, after losing two of his sons and his wife, he removed with his daughters to Mavis Bush, a cottage at Lasswade. He died at his lodging in Lothian Street, Edinburgh, Dec. 8, 1859, and was buried by the side of his wife in the West churchyard.

With the exception of a novel, Klosterheim, 1832, and The Logic of Political Economy, 1844—he



*Thomas de Quincey*

was a student of Ricardo—all he wrote appeared first in periodicals. In The London, Sept. and Oct., 1821, he wrote two anonymous articles, The Confessions of an English Opium-Eater, reproduced in volume form, 1822, and almost re-written in 1856. To Blackwood's, Feb., 1827, he contributed the essay On Murder Considered as One of the Fine Arts, to which in 1854 was added a notable postscript. In the same magazine appeared his studies of Kant and Samuel Parr, sketches of the Caesars, The Revolt of the Tartars, and papers on Style, Rhetoric, The Philosophy of Herodotus, the mystical Suspiria de Profundis (Sighs from the Depths), and The English Mail Coach. In Tait's appeared his recollections of Lakeland and its poets, and a study of Joan of Arc. To the Encyclopaedia Britannica he contributed articles on Goethe, Schiller, Shakespeare, and Pope. In his essay on Pope is his memorable distinction between the literature of knowledge and the literature of power.

#### Master of Imaginative Prose

His critical faculty is displayed to advantage in the essay on The Knocking at the Door in Macbeth, his humour in Sortilege and Astrology, his quality as a dreamer in the Suspiria and the Confessions. His intellect was acute and logical, but his habit of always aiming at artistic effect and his discursiveness lessen the value of much of his work, which lives chiefly by virtue of its style, for above all else De Quincey was a master of imaginative and melodious prose as well as of narrative. His writings were issued in collected form at Boston, U.S.A., 20 vols., 1851–59; at Edinburgh, 14 vols., 1853–60, supervised by the author.

An affectionate husband and father, and generous to a fault, De Quincey's ornate prose was in striking contrast to his simplicity of life, as his lack of method in money matters was in contrast to his acute understanding of political economy. He never freed himself from his love of wandering, but his battle against opium, and his industry in defiance of physical infirmity, testify to a far stronger will than that of his fellow-dreamer Coleridge. He was a great walker, and, in congenial company, a fascinating talker, with a voice of singular charm. The best descriptions of his personal appearance are those by Carlyle, Hood, and J. R. Findlay.

W. F. Aitken

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**Deraa.** Town of Syria. It is situated about 40 m. E. of the S. end of the Sea of Galilee, and is a junction on the Hejaz rly. The Hejaz Arab army here cut off the retreat of the Turks from the S. before Allenby's offensive, and occupied the town Sept. 28, 1918.

**Dera Ghazi Khan.** District and town of W. Punjab, Pakistan, in Multan division. They are situated between the Indus and Baluchistan. The dist., whose area is 9,364 sq. m., yields wheat, millets, rice, pulses, cotton, and indigo. The town suffered considerably from Indus floods until a stone embankment was built in 1891. Pop. dist., 581,350, five-sixths Mahomedans; town 21,500. Baluchis form 42 p.c. of the total pop.

**Derain, ANDRÉ** (b. 1880). French painter. Born at Chatou, near Paris, June 10, 1880, he showed interest in engineering during his youth, but encouraged by Vlaminck he studied art at Julian's and later worked with E. Carrière. Influenced by Picasso and Braque, he developed his own style, interpreting landscape in the classic manner, attempting in his later compositions to reconcile the classic and medieval traditions. His colour showed the influence of Giotto and Cimabue. His portraits and still lifes were well represented in the modern galleries of London, Paris, New York, and Moscow.

**Dera Ismail Khan.** Dist. and town of Pakistan, in the North-West Frontier province. They are named after the son of a Baluchi chieftain, who settled in the district in the latter part of the 15th century. The area of the district is 3,780 sq. m. Less than a quarter of the district is under cultivation, but camels are bred. The town is situated  $4\frac{1}{2}$  m. W. of the Indus. The chief tribes are Pathans and Jats, Mahomedans forming 90 p.c. of the pop. Pop. dist., 298,131; town, 42,150.

**Derajat.** Name given to the plain lying between the Indus river and the Sulaiman range in the West Punjab and N.-W. Frontier provs. of Pakistan. It is so called from the three Deras situated in it—Dera Ismail Khan, Dera Fateh Khan, and Dera Ghazi Khan. This region came under Baluchi rule in the 15th century, and passed into British possession in 1849. The Derajat is 325 m. long, 50 m. wide.

**Derbend.** Town and port of Russia, in Daghestan A.S.S.R. It is on the Caspian Sea, and is connected by rly. with Makhach-Kala and Baku. Madder, fruit, and tobacco are cultivated, and arms, silk, and woollen goods manufactured. The remarkable burying-ground has Kufic inscriptions. The town was incorporated with Russia in 1813. Pop. 23,000.

**Derby.** County, mun., and parl. borough and county town of Derbyshire, England. It stands on the W. side of the Derwent, 129 m. N.W. of London, and is well served by main line rlys. Although an old and historic town, its modern importance dates



Derby borough arms

from the establishment here, 1844, of the shops of the Midland rly.

Derby is the seat of a bishop. The chief churches are All Saints', famous for its magnificent tower, 210 ft. high, and its internal adornments and tombs; S. Peter's, a Decorated Perpendicular building; S. Alkmund's, S. Werburgh's, and S. Andrew's, the work of Sir Gilbert Scott. The Roman Catholics have a fine church dedicated to S. Mary Magdalen, and there are many Nonconformist places of worship. The grammar school is one of the oldest in England; there are a technical school, a school of art, etc. The royal infirmary and the art gallery, with a fine collection of old Derby ware, should be mentioned; while the few old

buildings include a chapel (14th century) on S. Mary's Bridge. The almshouses founded by Bess of Hardwick were pulled down in 1920. In the Arboretum grounds is the Headless Cross, a memorial of the plague of 1665.

In addition to the rly. works, which cover over 200 acres, the industries include the manufacture of silk, lace, net, and hosiery. There are engineering works, saw-mills, and tanneries, and works for making chemicals, paint, etc., while Crown Derby china is made at works in the Osmaston Road. The town has a service of trolley-buses, a theatre, several music halls, cinemas, etc. Near by is a racecourse. Derby is governed by a mayor and council. There are two parliamentary constituencies, Derby North and Derby South, each returning one M.P.

At Little Chester the Romans had a station, but the town really originated in Anglo-Saxon times. Made a fortified town, it was one of the five burghs held by the Danes from 878, until recovered by the English in the 10th century. It gave its name to the county, and has since then, as the co. town, been a place of importance. In 1715 the first silk mill in England was opened here, and about 1750 the porcelain known as Crown Derby was first made. It received its first charter in 1206; this gave the burgesses the local monopoly of dyeing cloth. Derby was first known to the Saxons as Northworthige, altered to its present name by the Danes. Market day, Fri. Pop., est. 131,500.

**Derby, EARL OF.** English title borne since 1485 by the family of Stanley. There were earls of Derby in Norman times, belonging to the Ferrers family, and variously called earl of Derby, of Notting-

ham, of Tutbury, or of Ferrers. They were distantly related to the Shirleys (see Ferrers, Earl). They held it until about 1266, when one of them lost his lands and honours for rebelling against Henry III, and Henry's son, Edmund, earl of Lancaster, received them. The title was held for a time by members of the royal family; hence Henry IV, before his accession, was sometimes called Derby.

Thomas, Lord Stanley, was made earl of Derby by Henry VII in 1485, although he had no connexion with Derbyshire. When James, the 10th earl, died in 1736, the direct line became extinct, and the title passed to Sir Edward Stanley, a descendant of the 1st earl. The most notable member of the family was Edward, the 14th earl, thrice prime minister, who, like his three successors, is described on the next page. In 1948, Edward (b. 1918) became the 18th earl. An eldest son is called Lord Stanley. Knowsley, near Liverpool, was a family possession from 15th cent.



Derby. Busy street known as the Cornmarket. Upper picture, Irongate and the fine tower of the church of All Saints

**Derby, THOMAS STANLEY, 1ST EARL OF (c. 1436-1504).** English soldier. The son of Thomas, Lord Stanley, and a great-grandson of Sir John Stanley, the founder by a rich marriage of the family fortunes, he first appeared in public life during the Wars of the Roses.



Thomas, 1st Earl of Derby  
after Holbein

He married Eleanor, a sister of Warwick, the king-maker, and like him alternated between York and Lancaster. He served Henry VI, Edward IV, and Richard III, but is better known for his connexion with Henry VII, whose mother, Margaret Beaufort, was his second wife. To the last he remained undecided between Richard and Henry, and at Bosworth held aloof with his forces from the fight. On the issue being decided he hailed Henry as king, and was made earl of Derby. He died July 29, 1504.

**Derby, EDWARD GEOFFREY STANLEY, 14TH EARL OF (1799-1869).** British statesman. Born at Knowsley, March 29, 1799, he was the eldest son of the 13th earl, then Lord Stanley. He was educated at Eton and Christ Church, Oxford, and won the chancellor's prize for Latin verse.

He entered the house of commons in 1820 as M.P. for the small bor. of Stockbridge, and soon made a reputation as a speaker. He was then a Whig. In 1826 he was returned for Preston, where the Stanley influence was supreme, and in 1827 he was made under-secretary for the colonies. Soon in opposition again, he strenuously supported the Reform bill of 1832. In 1830 he had become chief secretary for Ireland in Lord Grey's ministry and, having been beaten at Preston, had become M.P. for Windsor, and in 1832 for North Lancashire. Meanwhile, he was managing the affairs of Ireland, then in a critical condition, and was having his famous verbal duels with O'Connell.

In 1833 Stanley entered the cabinet as secretary for war and the colonies, in which office he carried the bill for freeing the slaves.

In 1834 Stanley, with others, left the Whig government. He remained a private member until 1841, when he became colonial secretary under Peel, from whom he separated when the Corn Laws were repealed. In 1844 he entered the house of lords, being called there as Baron Stanley, and acted as the leader of the party soon known as the Conservative. In 1851 he succeeded to the earldom.

In 1852 Derby became premier for the first time. He held the office, however, for less than a year, being defeated on the budget, and for six years he was leader of the opposition. In 1858 his second term as premier began, but this too was brief, as in June, 1859, the franchise bill having proved unacceptable, he resigned. Seven more years as leader of the opposition followed, then in 1866 Derby became prime minister for the third time. His govt. passed the Reform Act of 1867. In 1868, then in failing health, he resigned. He died at Knowsley, Oct. 23, 1869.

Derby stands in the line of the great British statesmen who were also scholars. He was greater, however, as an orator, and richly endowed with the gift of making prompt and apt replies. Bulwer Lytton called him the Rupert of Debate.

**Derby, EDWARD HENRY STANLEY, 15TH EARL OF (1826-93).** British politician. The eldest son of the 14th earl, whom he succeeded in 1869, he was born July 21, 1826, and educated at Rugby and Trinity College, Cambridge. From 1848-69 he was Conservative M.P. for King's Lynn. In 1852 he was under-secretary for foreign affairs in his father's first ministry; in the second (1858-59) he was secretary for the colonies, president of the board of control, and first secretary for India, and in the third (1866-68) foreign secretary.

Derby's Toryism was never extreme; in some matters, notably his dislike of war and his interest in education, he was in sympathy with quite another school of thought, and he avowed his admiration for J. S. Mill's teaching. Invited in 1855 to join the Liberal cabinet, he refused to desert his party, and in 1874 was made foreign minister for the

second time. In 1878 came the inevitable breach with the Tories. Derby, who could not support an aggressive policy with regard to Russia, resigned, and in 1879 joined the Liberals. In 1882 Gladstone made him colonial secretary, and he remained in office until 1885. He died at Knowsley, April 21, 1893, and having no sons was succeeded by his brother (*v.i.*). His Speeches and Addresses appeared in 1894.

**Derby, FREDERICK ARTHUR STANLEY, 16TH EARL OF (1841-1908).** British politician. Younger son of the 14th earl.



Derby  
Russell

he was born in London, Jan. 15, 1841, and educated at Eton. After serving in the Grenadier Guards, 1858-65, he was Conservative M.P. for Preston, 1865-68, N. Lancs., 1868-85, and Blackpool, 1885-86.

Created Baron Stanley of Preston in 1886, he held office as civil lord of the admiralty, secretary for war and for the colonies, and president of the board of trade. Lord Stanley was gov.-gen. of Canada, 1888-93; first lord mayor of Liverpool, 1895-96; mayor of Preston, 1901-02; and first chancellor of Liverpool university. Made G.C.B., 1880, and K.G., 1897, he succeeded his brother in the earldom in 1893, and died June 14, 1908.

**Derby, EDWARD (GEORGE VILLIERS) STANLEY, 17TH EARL OF (1865-1948).** British politician.

Born April 4, 1865, he was educated at Wellington College and served for some years in the Grenadier Guards. He entered the house of commons in 1892,



Edward, 17th Earl of Derby  
Russell

and during the earlier part of the South African War was chief press censor and private secretary to Lord Roberts. In 1895, then Lord Stanley, he joined the Conservative govt. as a lord of the treasury and in 1900 became financial secretary to the war office, becoming P.M.G. 1903. He succeeded to the earldom in 1908. In 1915, as director-

general of recruiting, he originated the scheme named after him. He was under-secretary at the War office, then war secretary 1916-18. Ambassador to Paris 1918-20, he was again at the war office 1922-24. A patron of the turf, he won the Derby with Sansovino in 1924, Hyperion in 1933, and Watling Street in 1942, the first of his family to succeed for over a century. He died Feb. 4, 1948. One of his sons was Oliver Stanley (q.v.). See Derby Scheme.

**Derby China.** Glazed earthenware originally made at Derby in 1750. This was improved upon by



Derby China. vase with landscape view  
Victoria & Albert Mus.

William Duesbury, who bought the Chelsea china works in 1769, and the Bow factory in 1776, carrying both on for a time. Subsequently he closed them, beginning to manufacture Chelsea-Derby china in 1784. His china has a hard, fine, remarkably transparent body, is well designed and beautifully decorated, and shows great variety. The bright blue borders of his dinner and tea services are characteristic. He also produced small enamelled and gilt figures, and others of a larger size in a beautiful soft paste, chalk white biscuit-ware, recognized as of the highest merit. These figures rarely bear the crown, D, and crossed sticks with which Crown Derby services and decorated pieces are usually marked.

The works were closed down in 1849, but the Derby china tradition is still carried on by the Royal Crown Derby Porcelain Co. founded in 1877. See Chinaware; Pottery.

**Derby Scheme.** Method of obtaining recruits for the British army during the First Great War. Towards the end of 1915 the numbers of recruits were below the point essential to the conduct of the war. The government deciding to adhere to the voluntary system, Lord Derby, as director-general of recruiting, devised the scheme known by his name. All men between 18 and 41 were invited to enlist, and the recruits were then ranged in 46 age groups, 23 of married and 23 of unmarried men. They were to be called to the colours in groups beginning with the younger men, the unmarried being called first.

The campaign began in Oct., 1915. Men who came forward "attested" and technically joined the army, but then returned home, wearing the "Derby armet," until called up. The total number who offered themselves under the scheme was 2,829,263, of whom 1,679,263 were married. Moreover a number of the attested men were either indispensable to civilian work or unfit. The result was a net addition to the army of only about 850,000 men. According to the National Register 2,182,178 remained un-attested, of whom 1,152,947 were single. Compulsion was therefore seen to be inevitable, and the necessary bill was introduced into parliament on Jan. 5, 1916.

**Derbyshire.** A Midland county of England. The surface, flat in the S., and undulating and rugged towards the middle and E., is highly picturesque in the N.,

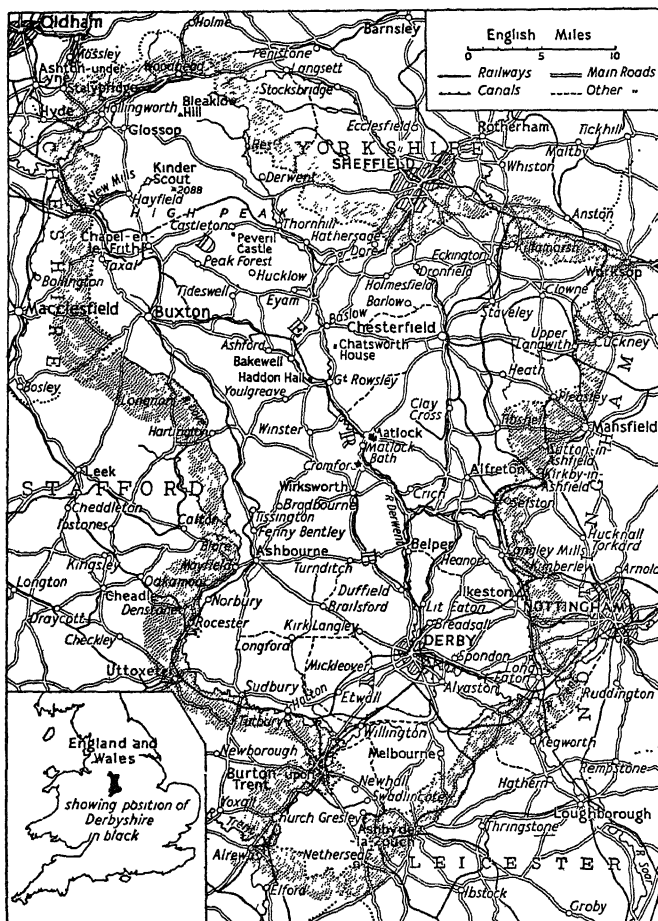
where the Pennine Chain terminates in the Peak district, the watershed between the rivers Mersey and Trent. The valley scenery of the Derwent and Dove is famous, as are the springs of Matlock, Buxton, and Bakewell. Much of the county



Derbyshire arms

is on a coalfield; other mineral products include limestone, gypsum, ironstone, fireclay, gannister, fluorspar, lead, and zinc. Permanent pasture makes up four-fifths of the cultivated area. Textile manufactures comprise silks, cotton, worsted, and hosiery; malting and brewing are considerable interests, and iron-foundries employ many workers.

The co. is well served by main line rlys. and by the Trent and Mersey, Derby, and other canals.

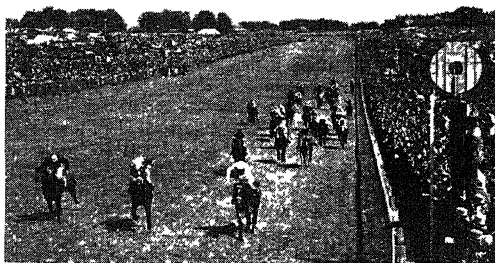


Derbyshire. Map of this midland county of England, famous for its natural beauties, medicinal springs, and varied industries

Derby is the co. town, and others of importance are Chesterfield, Ilkeston, Alfreton, and Glossop. Chatsworth and Haddon Hall are within the co. Seven M.P.s are elected, apart from two for Derby, and one for Chesterfield. Area, 1,012 sq. m. Pop. 757,374.

LITERARY ASSOCIATIONS. Beresford Dale is described in Cotton's continuation of Izaak Walton's *Compleat Angler*. Jane Austen writes of Chatsworth as Pemberley in *Pride and Prejudice*, while Sir Walter Scott centres his *Peveril of the Peak* in the Peak district. The county is the Stonyshire of George Eliot's *Adam Bede*. Derbyshire farms and moors figure in novels by R. Murray Gilchrist, and Kinder Scout supplies some of the scenery of Mrs. Humphry Ward's *David Grieve*. *Consul* Feudal History of the County, J. P. Yeatman, G. R. Sitwell, and C. J. S. Foljambe, 1886, etc.; *Victoria History of the County*, ed. W. Page, 1905, etc.; *Odd Corners in Derbyshire*, W. T. Palmer, 1944.

**Derby Stakes.** Principal horse race in the U.K., or in fact in the world. Inaugurated in 1780 by the twelfth earl of Derby, it has



Derby Stakes. The 1949 finish, the first decided by a photo-finish camera. The winner was Nimbus (centre)

been held every year since, and takes place normally on Wed. of the Epsom summer meeting, except that in the war years 1915-18 and 1940-45 a substitute event was decided at Newmarket. The race is for three-year-olds, colts and fillies, and the course is 1½ m. on a left-hand turn, including the famous Tattenham Corner.

Record time, 2 min. 33 4/5 sec., is attributed to the 1936 winner Mahmoud. The smallest winner was Little Wonder (1840), who stood 14 hands 3¼ ins. On two

son, a suffragette, was fatally injured in causing the king's horse Anmer to fall at Tattenham Corner. The first woman owner to win an Epsom Derby was Mrs. G. B. Miller in 1937. S. Donoghue rode seven winners, counting substitute races: 1915, 1917, 1918, and 1921, 1922, 1923, 1925.

In 1867 the marquess of Hastings lost £120,000 through laying against Hermit. Snow fell before that race, and during the race in 1839. When St. Amant won in 1904 a terrific thunderstorm broke

occasions the horse first past the post has not been awarded the race: Running Rein in 1844 was later discovered to be a four-year-old, and the race was given to Orlando; and in 1913 Craganour was disqualified for bumping and boring, the race going to Aboyeur. During that same race Emily Davi-

#### DERBY STAKES: Winners and Owners

1780, *Diomed* Bunbury; 1781, *Y. Eclipse*, O'Kelly; 1782, *Assassin*, Ld. Egremont; 1783, *Salttram*, Parker; 1784, *Serjeant*, O'Kelly; 1785, *Amwell*, Ld. Clermont; 1786, *Noble*, Pantou; 1787, *Sir Peter Teagle*, Ld. Derby; 1788, *Sir Thomas*, Prince of Wales; 1789, *Skuscraper*, D. of Bedford; 1790, *Rhadamanthus*, Ld. Grosvenor; 1791, *Eager*, D. of Bedford; 1792, *John Bull*, Ld. Grosvenor; 1793, *Wary*, Poole; 1794, *Daedalus*, Ld. Grosvenor; 1795, *Spread Eagle*, Standish; 1796, *Didelot*, Standish; 1797, colt by *Fidget*, D. of Bedford; 1798, *Sir Harry*, Cookson; 1799, *Archduke*, Standish; 1800, *Champion*, Wilson; 1801, *Elvanor*, Bunbury; 1802, *Tyrant*, D. of Grafton; 1803, *Ditto*, Williamson; 1804, *Hannibal*, Ld. Egremont; 1805, *Cardinal Beaufort*, Ld. Egremont; 1806, *Paris*, Ld. Foley; 1807, *Election*, Ld. Egremont; 1808, *Pan*, Williamson; 1809, *Pope*, D. of Grafton; 1810, *Whalebone*, D. of Grafton; 1811, *Phantom*, Shelly; 1812, *Octavius*, Ladbroke; 1813, *Smolensko*, Bunbury; 1814, *Blucher*, Ld. Stawell; 1815, *Whisker*, D. of Grafton; 1816, *Prince Leopold*, D. of York; 1817, *Azor*, Payne; 1818, *Sam Thornhill*; 1819, *Tresvas*, D. of Portland; 1820, *Sailor*, Thornhill; 1821, *Gustavus*, Hunter; 1822, *Moses*, D. of York; 1823, *Emilius*,

Udney; 1824, *Cedric*, Shelly; 1825, *Middleton*, Ld. Jersey; 1826, *Lapdog*, Ld. Egremont; 1827, *Mame-luke*, Ld. Jersey; 1828, *Cadland*, D. of Rutland; 1829, *Frederick*, Gratwicke; 1830, *Prism*, Chifney; 1831, *Spaniel*, Ld. Lowther; 1832, *St. Giles*, Ridsdale; 1833, *Dangerous*, Sadler; 1834, *Plenipotentiary*, Batson; 1835, *Mundig*, Brown; 1836, *Bay Midalton*, Ld. Jersey; 1837, *Phosphorus*, Ld. Berner; 1838, *Amato*, Heathcote; 1839, *Bloomsbury*, Ridsdale; 1840, *Little Wonder*, Robertson; 1841, *Coronation*, Rawlinson; 1842, *Attila*, Anson; 1843, *Cotherstone*, Bowes; 1844, *Orlando*, Peel; 1845, *Merry Monarch*, Gratwicke; 1846, *Pyrhus the First*, Gully; 1847, *Cossack*, Pedley; 1848, *Surplice*, Ld. Clifden; 1849, *The Flying Dutchman*, Ld. Eglington; 1850, *Voltigeur*, Ld. Zetland; 1851, *Teddington*, Hawley; 1852, *Daniel O'Rourke*, Bowes; 1853, *West Australia*, Bowes; 1854, *Andover*, Gully; 1855, *Wild Dayrell*, Popham; 1856, *Ellington*, Harcourt; 1857, *Blink Bonny*, T'Anson; 1858, *Beadsman*, Hawley; 1859, *Musyd*, Hawley; 1860, *Thormanby*, Merry; 1861, *Ketledrum*, Towneley; 1862, *Caractacus*, Snelling; 1863, *Macaroni*, Naylor; 1864, *Blair Athol*, T'Anson; 1865, *Graduateur*, Ct. de Lagrange; 1866, *Lord Lyon*, Sutton; 1867, *Hermi*, Chaplin; 1868,

*Blue Gown*, Hawley; 1869, *Pretender*, Johnstone; 1870, *Kingcraft*, Ld. Falmouth; 1871, *Favonius*, Bn. Rothschild; 1872, *Cremorne*, Savile; 1873, *Doncaster*, Merry; 1874, *George Frederick*, Cartwright; 1875, *Galopin*, Prince Bathynay; 1876, *Kisber*, Baltazzi; 1877, *Silvio*, Ld. Falmouth; 1878, *Sefton*, Crawford; 1879, *Sir Bevis*, Acton; 1880, *Bend Or*, D. of Westminster; 1881, *Iroquois*, Lorrilard; 1882, *Shotover*, D. of Westminster; 1883, *St. Blaise*, Johnstone; 1884, *St. Gatien*, Hammond; 1885, *Harvester*, Wiloughby; 1886, *Melton*, Ld. Hastings; 1886, *Ormonde*, D. of Westminster; 1887, *Merry Hampton*, Abington; 1888, *Ayrshire*, D. of Portland; 1889, *Donovan*, D. of Portland; 1890, *Sainfoin*, Miller; 1891, *Common*, Johnstone; 1892, *Sir Hugo*, Ld. Bradford; 1893, *Isinglass*, McCalmont; 1894, *Ladas*, Ld. Rosebery; 1895, *Sir Visto*, Ld. Rosebery; 1896, *Persimmon*, Prince of Wales; 1897, *Galtie More*, Gubbins; 1898, *Jeddah*, Larnach; 1899, *Flying Fox*, D. of Westminster; 1900, *Diamond Jubilee*, Prince of Wales; 1901, *Volodyovski*, Whitney; 1902, *Ard Patrick*, Gubbins; 1903, *Rock Sand*, Miller; 1904, *St. Amant*, Leopold de Rothschild; 1905, *Cicero*, Ld. Rosebery; 1906, *Spearmint*, Loder; 1907, *Orby*, Croker; 1908, *Signorinetta*, Ginistrelli; 1909, *Minoru*, King Ed-

ward VII; 1910, *Lembury*, Fairie; 1911, *Sunster*, Joel; 1912, *Tapiha*, Raphael; 1913, *Aboyeur*, Cunliffe; 1914, *Durbar II*, Durvea.

(1915, *Pommern*, Joel; 1916, *Finella*, Hulton; 1917, *Gay Crusader*, Fairie; 1918, *Gainsboro*, Lady J. Douglas.)

1919, *Grand Parade*, Ld. Glanely; 1920, *Spion Kop*, Loder; 1921, *Humorist*, Joel; 1922, *Capt. Cuttle*, Ld. Woolavington; 1923, *Papyrus*, Irish; 1924, *Sansovino*, Ld. Derby; 1925, *Manna*, Morriss; 1926, *Coronach*, Ld. Woolavington; 1927, *Call Boy*, Curzon; 1928, *Felstead*, Cunliffe-Owen; 1929, *Trigo*, Bennett; 1930, *Blenheim*, Aga Khan; 1931, *Cameronian*, Dewar; 1932, *April the Fifth*, Walls; 1933, *Hyperion*, Ld. Derby; 1934, *Windsor Lad*, Maharaja of Rajpipla; 1935, *Bahram*, Aga Khan; 1936, *Mahmoud*, Aga Khan; 1937, *Mid-day Sun*, Mrs. Miller; 1938, *Bois Roussel*, Beatty; 1939, *Blue Peter*, Ld. Rosebery.

(1940, *Pont L'Évêque*, Darling; 1941, *Owen Tudor*, Mrs. Macdonald-Buchanan; 1942, *Watling Street*, Ld. Derby; 1943, *Straight Deal*, Miss Paget; 1944, *Ocean Swell*, Ld. Rosebery; 1945, *Dante*, Ohlson.)

1946, *Airborne*, Ferguson; 1947, *Pearl Diver*, Baron de Waldner; 1948, *My Love*, Aga Khan; 1949, *Nimbus*, Mrs. Glenister



over the course. In Sansovino's year (1924) the runners were fetlock deep in mud. The 1949 race was the first to be decided by the Photo-finish Camera (*q.v.*).

**Derceto.** Greek name of an Assyrian goddess, identified with Astartē (*q.v.*). She is represented in the form of a mermaid. Semiramis (*q.v.*) was supposed to be her daughter. *Pron.* Der-see-to.

**Dereham** OR EAST DEREHAM. Market town and urban dist. of Norfolk, England. It is on the railway, 122 m. N.N.E. of London and 22 m. W.N.W. of Norwich, and is an agricultural centre, the chief industries being the manufacture of agricultural implements and malting. The church of S. Nicholas is a fine Perpendicular building containing the tomb of William Cowper, whose residence here is commemorated by the Cowper Memorial Church of the Congregationalists. Borrow was born at Dimpling Green, 1½ m. to S., and Dereham is the "pretty, quiet D—, thou pattern of an English county town" of Lavengro. Here is a branch of Dr. Barnardo's Homes. Market day, Fri. Pop. 6,214.

**Derelict** (Lat. *de*, from; *relinquere*, to leave). Term used in two connexions in English law. (1) A vessel abandoned by its crew at sea. By the Merchant Shipping (Safety and Load Line Conventions) Act of 1932 the master of any British ship on meeting a dangerous derelict must send information to ships in the neighbourhood and to authorities prescribed by the Board of Trade. Warnings of the presence of derelicts on shipping routes are regularly broadcast to ships; radar enables derelicts to be detected in poor visibility. Derelicts are frequently destroyed by warships. The points at which derelicts are sighted at different dates are sometimes marked upon the monthly pilot charts of the admiralty, and serve to give some indication of the surface drifts of the oceanic waters. (2) Lands over which the sea used to come which have been suddenly, not gradually, left high and dry by the sea receding therefrom.

**Derg.** Lough or lake of Eire in the S. of co. Donegal. It contains numerous small islands, on one of which—Station Island—is the cave of S. Patrick's Purgatory, largely resorted to by pilgrims. On Saints' Island there are monastic ruins. The lake has an area of 25 sq. m.

**Derg.** Lough or lake of Eire, forming part of the boundaries of counties Tipperary, Clare, and Galway. An expansion of the Shannon river due to the hard rocks of the Killaloe gorge, it is 24 m. long and from 1 m. to 2 m. broad, greatest depth, 120 ft.

**Dermatitis** (Gr. *derma*, skin). Inflammation of the skin. The condition presents a variety of forms and may be due to numerous causes. The more important are certain predisposing diseases; application of irritant substances such as mustard or croton oil; trade processes, as among persons handling paraffin, tar, dyes, bichromate of potash, etc.; too long exposure to X-rays; irritation from parasites, as in scabies; sunburn, frostbite, and allergy.

**Dermoid Cyst.** Sac in which dermal structures, such as hair, skin, and teeth, may develop. It occurs most frequently as a tumour in the ovary.

**Derna.** Town in Cyrenaica, N. Africa. It stands on the Mediterranean, 140 m. E.N.E. of Benghazi. It passed from Turkish to Italian ownership after the war of 1912. During the Second Great War Derna was taken from the Italians by British Imperial troops on Jan. 30, 1941, in their advance to Benghazi. Recaptured by Germans and Italians on April 7, it fell to the British 8th army on Dec. 19 in a winter offensive. Rommel in the German advance upon Egypt reoccupied Derna on Feb. 3, 1942, and it was finally liberated on Nov. 16 in the course of Gen. Montgomery's triumphant advance to Tripoli. In normal times there is trade in hides and wool. Pop. 21,547.

**De Ros, BARON.** Premier barony of England. The title dates from 1264, when Robert de Ros, one of the barons who revolted against Henry III, was summoned to parliament. His son William was one of the candidates for the Scottish throne after the death of Margaret, the Maid of Norway. The 4th baron fought at Crecy, the 7th was lord high treasurer, the 8th was killed fighting in France, and the 10th lost all his possessions in the Wars of the Roses.

In 1508 the 11th baron dying without sons, the title passed to George Manners. His son Thomas was made earl of Rutland. In 1587 the barony passed to Elizabeth, wife of William Cecil, earl of Exeter, reverting to the earl of Rutland in 1618. In 1632 it passed to Catherine, wife of George Villiers, duke of Buckingham. It was in abeyance 1687–1806, and then was granted to the wife of Lord Henry Fitzgerald. Una Mary Ross (b. 1879), succeeding her mother in 1943, became 26th baroness. *Pron.* De Ross.

**De Rougemont, LOUIS** (1847–1921). Name of a Swiss whose real name was Henri Louis Grin. Born at Gressy, Nov. 9, 1847, as a young man he travelled in England and Australia, and in 1898 caused a sensation in London by an account of his enforced exile of 28 years among the blacks of the Cambridge Gulf region. His story, accepted in good faith, began to appear in *The Wide World Magazine*. The same year, before the British Association at Bristol, he read two papers on his adventures, which were afterwards discredited, though later discoveries tended to confirm some of his observations. He died June 9, 1921.

**Déroulède, PAUL** (1846–1914). French author and politician. He was born in Paris, Sept. 2, 1846, was called to the bar in 1870, and served as a soldier in the Franco-Prussian War. His *Chants du Soldat*, 1872, and *Nouveaux Chants du Soldat*, 1875, attained extraordinary popularity. In 1877 his poetic drama, *L'Hetman*, achieved success; but production of his drama *La Moabitte*, 1880, was forbidden by the censor.

A strong nationalist, Déroulède founded the *Ligue des Patriotes*, suppressed by the government in 1889, in which year Déroulède was elected a deputy as a supporter of Boulanger. In 1899–1900 he was tried for high treason and banished from France for planning a *coup d'état* against the parliamentary constitution. He returned in 1905, and died Jan. 30, 1914.

**Derrick.** Term applied to a kind of crane, and also to the staging erected for oil-drilling. On



Derrick. Main derricks on a large liner  
S. C. Webb

board ship a derrick is a stout pole swung from a mast for lifting heavy weights. A derrick crane is a fixed crane, usually constructed of timber, consisting of a jib, vertical mast, and two raking timber backstays, weighted or made fast to prevent the crane from overturning. The range of horizontal movement is limited by the backstays, which prevent the crane from revolving in a complete circle. The word is derived from a hangman named Derrick, in allusion to the gallows-like appearance of a crane. *See* Crane.

**Derris.** Root of *Derris elliptica*, a woody climbing plant of the family Leguminosae, native of Malaya, Burma, Java, Sumatra, and the Philippines. Used as an insecticide and, by the natives, as a fish poison, it contains the active principle rotenone (tubotoxin). For derris powder, *see* Insecticide.

**Derry.** This is a shortened form of the name of the Irish city Londonderry (*q.v.*).

**Dervish** (Pers. *darwish*, poor; Arab. *faqir*, fakir). Persian, Turkish, or Arab devotee. Some are



Derwent Valley Water Board. Ladybower Reservoir, opened by King George VI in 1945. It has a capacity of 6,300 million gallons

the Indian bazaars. The Kalanderiyeh or wandering dervishes regard constant travel as obligatory. The Maulawiyeh or Maulivehs, known as dancing dervishes, lacerate the body and swallow live coal, glass, and serpents; it was said in 1948 that the last of these had died in Istanbul. The modern order of the Senussi, which has spread over Arabia and N. Africa, is strictly Mahomedan. *See* Mahdi.

**Derwent.** River of Cumberland, England. It rises near Scafell and flows N. through Borrowdale to Derwentwater, N.W. to Bassen-thwaite, thence W. to the Solway Firth at Workington. Its length is about 35 m.

**Derwent.** River of Derbyshire, England. It rises in the High Peak and flows in a S. direction for about 60 m. past Chatsworth, Matlock, and Derby to the Trent. For the Derwent Valley Water Board, *see* below.

**Derwent.** River of Yorkshire, England. It rises on the moors of the N. Riding, which it drains, and flows mainly S.W. to form the boundary with the E. Riding. Having passed through the Carrs and by Malton, it joins the Ouse at Barmby. Its length is about 70 m., and it is navigable as far as Malton. A canal connects it with Pocklington.

**Derwent.** River of England, forming part of the boundary between Northumberland and Durham. It flows for 30 m. N.E. to the Tyne at Derwent Haugh.

**Derwent.** River of Tasmania. It rises in Lake St. Clair and flows S.E. through a deep mt. valley to Hobart. Its length is 130 m.

**Derwent Valley Water Board.** Authority incorporated in 1899, with representatives of the corporations of Derby, Leicester, Nottingham, and Sheffield, and of Derbyshire county council. The

first instalment of its scheme was completed in 1912: the construction of masonry dams to form the Derwent and Howden reservoirs to impound the headwaters of the rivers Derwent and Ashop; an aqueduct from the former reservoir to the Ambergate service reservoir, with branches to Derby, Leicester, and Nottingham; and filters at Bamford. By 1930 the board had diverted the waters of the Ashop and Alport into the Derwent reservoir, thereby increasing the available supply to 20 million gallons per day.

In 1935 work began on the third instalment, the construction of the Ladybower reservoir, the largest earth embankment in the British Isles. It is 1,250 ft. long and 135 ft. high, and has a capacity of 6,300 million gallons. The reservoir was opened by King George VI on Sept. 25, 1945. Its construction had entailed the submerging of the picturesque village of Ashopton, and the 17th century Derwent Hall. Several miles of roads in the valley were also submerged; and two large viaducts of reinforced concrete were built to carry 5½ m. of new roads, together with water mains and post office cables, over arms of the reservoir.

**Derwentwater.** Lake of Cumberland, England. It is an expansion of the Derwent river; its



Derwentwater. Friar's Crag, a promontory on this Cumberland lake



Dervish. Typical Egyptian dervish with his begging bowl and rosary

strict Mahomedans; others combine nominal adherence to the Koran with Hindu mysticism and pantheism. Some live like the monastic orders of Christendom; others like hermits.

Their devotional exercises (*zikrs*) include invocations, bodily torture, and a frenzied, whirling dance said to symbolise the eternal existence of the Deity. At the close of the dance they fall into a cataleptic trance. The Rufaiyeh or howling dervishes mutilate the body; to the Muradiyeh belong the fakirs of



length is 3 m.; greatest breadth, 1½ m.; and extreme depth, 72 ft. The wooded islets which stud its surface and the steep crags around its shores, combined with the surrounding mts., produce a fine scenic effect. At the S. of the lake are the Falls of Lodore, on which Southey wrote a poem. Near them occasionally rises to the surface the remarkable floating island. The lake abounds in pike, perch, and trout.

**Derwentwater**, JAMES RADCLIFFE OR RADCLIFFE, 3rd EARL OF (1689–1716). A Jacobite hero.



James, 3rd Earl of Derwentwater  
After Kneller

Eldest son of the 2nd earl and a kinsman of the Stewarts, he was born June 28, 1689. A leader in the rebellion of 1715, he surrendered at Preston, was attainted, and was beheaded

on Tower Hill, Feb. 24, 1716. The aurora borealis is called locally "Lord Derwentwater's Lights," because it shone brilliantly on the night of his death. He is a famous figure in ballads, e.g. Lord Derwentwater's Good Night. F. J. A. Skeet wrote his life, 1929.

**Derzhavin**, GABRIEL ROMANOVITCH (1743–1816). Russian poet. Born at Kazan, July 3, 1743, the descendant of an ancient Tartar family, he became a soldier in 1760. He entered the government service later, and in 1782 established his fame as a poet with *Felitsa*, written in honour of the empress Catherine. In 1791 he was made secretary of state, in 1800 imperial treasurer, and in 1802 minister of justice. He retired the following year, and died July 21, 1816. Derzhavin was the greatest Russian lyric poet of his time.

**Desaguadero** (Span., outlet). River of Argentina. Between Mendoza and San Luis prov., it forms the N. part of the Río Salado.

**Desaguadero**. River of Bolivia. It issues from Lake Titicaca, on the borders of Peru, flows S.E., and empties into Lake Poopo; length about 190 m., partly navigable.

**Desaix de Veygoux**, LOUIS CHARLES ANTOINE (1768–1800). French soldier. Born in Auvergne, Aug. 17, 1768, he entered the army as a boy and first came into prominence in Moreau's retreat in the Black Forest in 1796, when he held out for two months against the Austrians in the ruined fortress

of Kehl. He added to his reputation in Italy in 1797 and won further glory by the conquest of Upper Egypt in 1799. Returning to Europe, he joined the French forces in Italy. His timely appearance at Marengo on June 14, 1800, secured victory for Napoleon, but Desaix was killed in the battle.

**Desborough**, WILLIAM HENRY GRENFELL, BARON (1855–1945). British politician and sportsman. Born Oct. 30, 1855, he was educated at Harrow and Balliol College, Oxford. Liberal M.P. for Salisbury. 1880–82 and 1885–86. Liberal Unionist for Hereford 1892–93, and Conservative for Wycombe from 1900, he was raised to the peerage in 1905. Chairman of the London Chamber of Commerce, the Thames Conservancy Board, the Central Chamber of Agriculture, and many other bodies, he was said at one time to be serving on 115 committees.

He excelled at cricket, rowing, and fencing, and was reputed to be the only man who was ever president of the O.U.B.C. and the O.U.A.C. For many years a steward at Henley Regatta, he became president of the M.C.C., and of the Lawn Tennis Association. As a young man he swam across Niagara, and stroked an eight across the Channel. His two eldest sons, Julian Grenfell (*q.v.*) and Gerald William Grenfell, were killed in the First Great War. There was no heir when Lord Desborough died Jan. 9, 1945.

**Descant** (Lat. *dis*, apart; *cantus*, song). In music, originally the old method of counterpoint in contrary motion. The canto fermo being usually in the tenor, the descant was above it, and so came to apply to the part for soprano or highest voice. In singing in church today a descant is a superimposed counterpoint rendered by the trebles of the choir, both popular and effective as an enrichment of hymn tunes.

**Descartes**, RENÉ (1596–1650). French philosopher and mathematician. He was born at La Haye in Touraine, March 31, 1596, and brought up at the Jesuit College of La Flèche in Anjou. Dissatisfied with his teachers and the learning to be obtained from books, he resolved to search for truth in himself and in the great book of nature and the world. After graduating in law at Poitiers in 1616, he led an unsettled life. He served in the army as a volunteer under Maurice of Orange and Tilly, perhaps took part in the siege of Rochelle, travelled exten-



Descartes  
After Franz Hals

sively, and at the age of 33 withdrew to Holland, where his *Discours de la Méthode plus la Dioptrique, les Météores et la Géométrie*, qui sont les *Essais de cette Méthode* (1637) and *Meditationes de Prima Philosophia* (1641) were published. These works at once made him famous, but at the same time led to bitter controversy. He was invited to England by Charles I, to France by Richelieu, and in 1649, after spending 20 years in detachment in various Dutch cities, he accepted an invitation to Stockholm from Queen Christina of Sweden. But the climate proved too severe for him, and he died, Feb. 11, 1650. His remains were removed to France in 1666 and interred at Ste. Geneviève du Mont in Paris. They were transferred to S. Germain-des-Près in 1819.

Descartes reasoned as follows: All presuppositions and traditional opinions must be abandoned as possibly untrustworthy. I can doubt everything except the fact that I doubt—in other words (doubt being a kind of thought), the fact that I think. But this very act of thinking proves my existence. In the words of his famous saying, *Cogito, ergo sum* (I think, therefore I am). Again, the notion of an infinite, perfect being (God) exists in my mind; since I am myself finite, this idea must have been implanted there by an infinite being who must therefore exist. This is known as the "ontological argument."

Descartes' four main principles are: To consider nothing as true which is not evidently known to be such by presenting itself so clearly and distinctly to the mind that it is impossible to doubt it; to divide each difficulty into as many parts as possible; to conduct one's thoughts in order,

beginning with what is simplest and easiest to understand, and gradually ascending to the knowledge of the most complex; to make the enumeration so complete and the reviews so general that one can feel sure that nothing has been omitted.

Descartes stands at the head of the school of mathematicians which linked up the mathematics of the Renaissance with modern mathematical writings. While a soldier at Breda, his attention was turned to the study of geometry by the exhibition of a placard conveying a challenge to all the world to solve a certain problem. He solved it, and in 1621 resigned his commission to study pure mathematics. The invention of analytical geometry dates from the publication of Descartes' *Géométrie*. He was the first to perceive that a point in a plane could be completely determined if its distances from two fixed lines drawn in that plane were known—hence the term Cartesian coordinates. His *Géométrie* consists of three books, the first two treating of analytical geometry, the third containing an analysis of the algebra then current. The chief interest of his discourse on Optics (*La Dioptrique*) lies in its statement of the law of refraction. The latinised form of his name, *Cartesius*, gives the adjective Cartesian.

*Pron.* Day-cart. *See* Coordinates; Geometry; Mathematics; Ontology; Philosophy.

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**Descent** (Lat. *descendere*, to come down). Word employed in genealogy to denote lineage or derivation from some particular ancestor. Lineal or direct descent is unbroken line from parent to child during two or more generations. Collateral descent indicates descent from a relation of the person from whom descent is claimed, e.g. a man is a lineal descendant of his grandfather, but the collateral descendant of his grandfather's brother.

**Descent of Man, THE.** Work by Charles Darwin applying his doctrine of the evolution of species to the origin of man. It was first published in 1871, and in a second

revised edition in 1874. It consists of two parts, the first on the pedigree of mankind, the second on sexual selection in the animal kingdom generally. *See* Darwin.

**Deschanel, PAUL EUGÈNE LOUIS** (1856-1922). French statesman. He was born at Schaarbeck,



Paul Deschanel,  
French statesman

Brussels, Feb. 13, 1856, having Victor Hugo as his godfather. Educated in Paris at the Lycée Condorcet, in 1877 he was secretary to Jules Simon, French premier. In 1878 he was sub-prefect at Dreux, and was elected a deputy for Eure-et-Loir, 1885. He attracted attention by speeches on the liberty of the press and a scheme of budget reforms. In 1893 he was wounded in a duel by Clemenceau.

A vice-president of the chamber in 1896 and 1897, Deschanel was president May, 1898-April, 1902. In 1905 he was made chairman of the standing committee on foreign affairs. He voted in favour of the separation of Church and state and was an ardent apostle of cooperative copartnership.

Again president of the chamber in 1912, during the First Great War Deschanel delivered speeches that had an inspiring effect on the morale of the nation. He was elected president of the republic at Versailles in 1920, in succession to Poincaré. On May 23 he fell out of a moving railway train, and on Sept. 16 he resigned. He died April 28, 1922.

A member of the Academy from 1899, Deschanel wrote many political works and biographies, notably Gambetta, 1920.

**Deschutes.** River of Oregon, U.S.A. Rising on the E. slopes of the Cascade range, it flows 320 m. N.N.E., through deep cañons, to the Columbia river at Fultonville, 12 m. above the Dalles.

**Desdemona.** Leading female character in Shakespeare's tragedy *Othello*. The daughter of Brabantio, a prominent senator of Venice, and clandestinely married to Othello, she is murderously smothered by her husband, who is falsely persuaded by Iago that she has been unfaithful.

**De Selincourt, HUGH** (b. 1878). English author. Born June 15, 1878, he was educated at Dulwich and University College, Oxford. He was dramatic critic of The

Star, 1910-12, and literary critic of *The Observer*, 1911-14. Cricket was one of his favourite subjects, and *The Cricket Match*, 1924, a fictitious description, is generally ranked among the best books ever written on any game.

**Desert** (Lat. *desertum*). Region in which few forms of life can exist owing to exceptional drought or exceptional cold or both. Desert conditions obtain in most places where the mean annual rainfall is less than 10 ins., because unless water is provided by other means life cannot be supported. It is noteworthy that the great hot deserts of the world (Sahara, Kalahari, Colorado, Atacama, West Australian) are on the W. of continents. Others are situated either in the interior, e.g. the Gobi in Asia, or in Arctic and Antarctic latitudes where the intense cold checks precipitation and makes life difficult.

Deserts may result from any of the following conditions: (a) persistent anticyclone (e.g. Sahara); (b) cold current on the W. edge of a large land mass (e.g. Peruvian); (c) mountain system shutting off moisture-laden winds (e.g. Gobi).

It is incorrect to describe deserts as wildernesses of sand, or monotonous plains. Many large areas in deserts are covered by drifting sand which is formed by the wind into an endless succession of dunes, but deserts are also often crossed by great mountain masses and have many bare, rocky tracts. In hot deserts great diurnal changes of temperature are experienced, causing the surface layer of exposed rocks to expand in the heat of the sun and to contract when the sun sets. This produces splitting, and fragments fall to the ground, the reduction to sand being accomplished by the agency of the wind. Except where there are underground supplies of water, as in oases, there is little vegetation in deserts, and all desert plants, such as the cactus and thorny scrub, have to root deeply in order to reach moisture. *See* Climate; Dust Bowl.

**Desertas.** Four small rocky islands in the Atlantic, S.E. of Madeira, to which they are administratively attached. They are called Bugio, Chao, Deserta Grande, and Sail Rock, and are uninhabited, being visited only by fishermen and herdsman.

**Deserted Village, THE.** Poem by Goldsmith, published May 26, 1770. In it he emphasises the

depopulation of country places and laments the increase of luxury. Full of tender feeling and human sympathy, it is one of the poet's most delightful works, and the source of a number of familiar quotations. There have been many attempts to identify the place described—Sweet Auburn—but it is evidently an imaginative blend of the poet's memories of Ireland and his observations in rural England.

**Desertion** (Lat. *deserere*, to abandon). Term meaning in general going away secretly and without permission, abandoning someone who has a claim upon one.

In a military sense the offence consists in being absent from a unit with the intention of either not returning or of escaping some important duty, such as foreign service. In Great Britain the offence of desertion is now dealt with under the Army and Air Force Act (*q.v.*), the penalty being penal servitude if the offender is on active service, otherwise imprisonment for a first offence and penal servitude for later offences. The death penalty was abolished in 1930.

A soldier is posted as a deserter after having been absent from his unit for 21 days; but he is not necessarily charged with desertion. His intention not to return to his unit must be proved before he can be convicted. The retention of his uniform or the act of surrendering to the civil or military authorities is usually accepted as evidence that an absentee did not intend to desert.

A seaman or apprentice in the mercantile marine who deserts his ship is liable to forfeit all his property on board and all his wages. If desertion takes place abroad, he may be imprisoned for twelve weeks. In the U.K. a seaman or apprentice who has deserted may be taken back to his ship by the master, mate, or owner with or without the assistance of the police, and out of the U.K. he may be arrested by any of the above without a warrant.

Desertion by a husband or wife for at least three years is a ground for judicial separation or divorce. A wife whose husband has deserted her may apply to a magistrate's court for a separation order or maintenance order. A man persistently neglecting to maintain his wife or child may be prosecuted.

**Desert Rats.** Nickname given to units of the British army during the Second Great War. The 11th Hussars were among the

British forces stationed in Egypt at the outbreak of the Second Great War, and became famous for their desert patrols, earning the nickname. Later the 7th armoured division, which included the 11th Hussars and formed part of the famous 8th



Desert Rats badge

army, adopted the jerboa, or desert rat, as a divisional sign and became generally known as the Desert Rats. See Eighth Army; North Africa Campaigns.

**Deshoulières, ANTOINETTE** (1638–94). A French poet. Born in Paris, Jan. 1, 1638, she married de Boisguerin, Seigneur Deshoulières, and was a prominent figure in literary circles in France in the time of Louis XIV. She wrote some indifferent tragedies and a number of madrigals, ballads, and idylls, the sole merit of which is a certain grace of diction. She died in Paris, Feb. 17, 1694.

**Desiccation** (Lat. *desiccare*, to dry up). In chemistry, the drying up of substances by removing water from them. There are various ways of doing this, and frequently an apparatus called a desiccator is used. The substance may be heated, thus increasing its vapour pressure; the air may be exhausted by air-pump, or dry air may be used. Certain chemicals, *e.g.* sulphuric acid and calcium chloride, are used for this purpose. Some forms of life are difficult to desiccate, and often survive the most complete applications of the process.

The process of removing water from foodstuffs, *e.g.* fruit and vegetables, with the object of reducing their bulk while maintaining their essential properties, is known as dehydration (*q.v.*).

**Design** (Lat. *designare*, to mark out). Plan or sketch for a completed work of art; and in a wider and more modern sense, for every branch of art as applied to industry. It has been said that design is to the graphic arts what verse form and rhyme are to poetry. The most common designs are those based on simple geometric forms, *e.g.* the formalised motifs upon Greek vases, but the term applies also to abstract compositions as in those of Paul Klee (*q.v.*).

Many schools have been established for the teaching of design. So far as the improvement of art products goes, these institutions

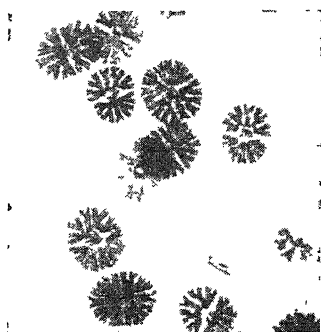
serve a similar purpose to that of the trade guilds of the Middle Ages, but, unlike them, do not concern themselves with control and regulation of trade. Their chief use is to counteract one of the inevitable consequences of the introduction of labour-saving machinery by giving to every worker a thorough theoretical and practical knowledge of his manual art. The international exhibitions of 1851 (London), Paris (1855), and Philadelphia (1876) gave an appreciable momentum to technical education in the U.K., France, and the U.S.A.; but greater benefits have accrued from the multiplication in most countries of technical institutes, polytechnics, and schools of art and design, the effects of which can be observed in the designs of many articles manufactured for the home. See Industrial Design.

**Design.** In theological argument, the evidence of divine creating intelligence contained in the organized form of the creature. It is held that just as the examination of the structure of a watch leads us to infer the existence of a watchmaker, so an examination of the universe, which exhibits natural arrangements adapted to certain ends, leads us to infer the existence of a divine and intelligent creator.

**Desire** (Lat. *desiderium*, longing.) A state of unsatisfied longing; a wish. The word is used in psychology both in these senses and more particularly for the tension which is set up when an instinctual disposition is roused by some appropriate stimulus and remains ungratified. Desires may be either conscious or unconscious. For theory of unconscious desire, see Unconscious. For disguises under which desires penetrate into consciousness during sleep, see Dream.

**Desman** (*Myogale*). A small insectivorous mammal, placed between the moles and the shrews. There are two species, both aquatic in habit, one found in Russia and the other in the Pyrenees. They vary from 10 to 16 ins. in length, have webbed feet, long trunk-like snouts, and scaly tails. They live in burrows beside the water, and their skins are valued for fur.

**Desmids** (Gr. *desmos*, chain). Single-celled microscopic Algae of the family Desmidiaceae. Almost exclusively they inhabit fresh water (mostly stagnant), where they often form a green scum on the surface. They are unattached—except temporarily—



Desmids. Specimens of *Micrasterias denticulata*. The actual length of each is about one hundredth of an inch  
J. J. Waid, F.E.S.

and have the power of independent motion. Some often combine to form thread-like colonies, but there is no real union of the plants. Multiplication takes place vegetatively by an individual dividing into two plants. There is also a process of conjugation between two plants whose protoplasm unites and forms a new desmid.

**Des Moines.** River of Minnesota and Iowa, U.S.A. It rises in the S.W. of Minnesota and traverses the centre of Iowa state in a S.E. direction, joining the Mississippi  $2\frac{1}{2}$  m. below Keokuk, after a course of 500 m.

**Des Moines.** Capital of Iowa, U.S.A., and co. seat of Polk co. It stands on both sides of the Des Moines river, 345 m. W. of Chicago, is served by eight rlys., and has several airports and bridges. One of the earliest U.S. cities to plan its development, it has a grand civic centre on the waterfront. Drake university and the American Institute of Business are in the city. Fort Des Moines is to the S. The chief products are meat, flour, clothing, iron and steel, bricks, tiles, and motor accessories; the surrounding district yields maize, and hogs are bred. Des Moines was settled 1843, incorporated as a town 1851, chartered as a city 1857, and has been governed by a commission since 1907. Pop. 159,819.

**Desmond, EARL OF.** Irish title borne until 1583 by the family of Fitzgerald. The earldom was created in 1329 for Maurice Fitz Thomas or Fitzgerald. The earl's second wife, Katherine Fitzgerald (d. 1604), was the old countess of Desmond, who certainly lived to be 104, and was reputed to have died at 140. In 1583 the title became extinct in the 15th earl, Gerald Fitzgerald, the "rebel earl," but several shadowy claimants appeared. It was conferred in 1619 on Richard Preston, Lord Ding-

wall, and at his death in 1628 passed by special remainder to George Feilding, who succeeded as earl of Denbigh in 1674. Since then the earldom of Desmond, conjoined with that of Denbigh, has been held by the Feilding family.

**Desmond, ASTRA.** British singer. She was educated at Nottingham high school and Westfield College, and was a pupil of Marchesi in Paris and of Grezebach in Berlin. From 1920 she appeared regularly at leading concerts and festivals, and was especially associated with Elgar's works, in which her mezzo-soprano voice was at its best. She also gave recitals of folk-songs of European countries. In 1928 she took part in the first broadcast performance of Stravinsky's *Oedipus Rex*, and she was long a popular broadcaster.

**Desmond, FLORENCE** (b. 1907). British actress. Born in London, May 31, 1907, she was trained as a dancer and first went on the stage in a London pantomime in 1916. Later she appeared in a number of revues, e.g. *On with the Dance*, 1925; *Charlotte's Masquerade*, 1930; *Streamline*, 1935, and made an outstanding reputation on the stage, screen, and radio by brilliant satirical impersonations of theatrical and film stars.

**Desmond, SHAW** (b. 1877). Irish author. Born in Ireland, Jan. 19, 1877, he was educated by monks there, and left school at 15 to work in London. Secretary and director of public companies, he gave up his business career for literature and journalism in 1909, sailed round Cape Horn in a windjammer, an experience which provided material for his successful travel-book *Windjammer*, 1932: and travelled 7,000 m. in Africa. He founded the International Institute for Psychical Research, 1934, and many of his books dealt with spiritualist experiences. One of his best-known novels was *Paradise Row*, 1945.

**Desmoulin, CAMILLE** (1760–94). French revolutionist. Born at Guise, Picardy, March 2, 1760, he became an advocate, but, hindered by an impediment in his speech, turned to political authorship. On hearing of the dismissal of Necker, July 12, 1789, he harangued a Paris crowd with the exhortation, "To arms!" His words marked the beginning of the Revolution. Two days later the Bastille fell. The issue of a republican pamphlet, *La France Libre*, and of *Desmoulin's* weekly journal, *Les Révolutions de France et de Brabant*, Nov., 1789–July, 1791, stimulated

the revolutionary movement. Influenced at first by Mirabeau, and later by Danton, Desmoulin was active in the overthrow of the Girondists. With Danton, like whom he sought to moderate the Terror, he was guillotined April 5, 1794. Eight days later his wife, falsely convicted, suffered the same fate. His life was written by J. Claretie, 1908; P. Compton, 1933.

**Desna.** River of Russia. Rising in the region of Smolensk, in R.S.F.S.R., it flows S.E. to Bryansk, then in Ukraine S.S.R. flows S.W. to Chernigov, and falls into the Dnieper near Kiev. It is navigable for nearly half of its course of 560 m. It supplies fish in abundance, and is an important commercial waterway.

**Despard, CHARLOTTE** (1844–1939). British social reformer. She was born at Ripple Vale, near



Charlotte Despard, British social reformer

Dover, a sister of the 1st earl of Ypres (q.v.). For many years president of the Women's Freedom League, she was a leader in the agitation for women's suffrage. On several occasions, 1907–13, she was imprisoned for her activities, and during and after the First Great War continued to advocate the rights of women in England and Ireland. She died Nov. 10, 1939.

**Despenser, HUGH LE** (1262–1326). English courtier. Son of the justiciar of England, who was killed at Evesham, he was born March 1, 1262, and served with Edward I in Scotland. His friendship with Edward II made him hated, and in 1321 the barons obtained a sentence of banishment against him. This was repealed the following year, and Despenser was enriched by many estates from the crown. The barons rallied to the queen, the mortal enemy of Despenser, and on her return from France in 1326 the king, retreating westward, left Despenser to hold Bristol. The town was against him: he surrendered, and on Oct. 27, 1326, was beheaded as a traitor outside Bristol.

**Despiau, CHARLES** (1874–1946). French sculptor. Son of a plasterer, he was born, Nov. 4, 1874, at Mont-de-Marsan, Landes. At 17 he went to Paris and studied at the École des Arts Decoratifs and the Beaux Arts. Rodin noticed

his work, and invited him to act as assistant in carving marbles in his studio. Despiau learnt from Rodin the refinements of his craft. With Petite Landaise in 1904 he showed the full promise of his talent, but public appreciation was slow. He was compared with Maillol, and his portrait busts were remarkable for intensity of expression. He executed a war memorial for his native town. An exhibition of his work was held in London in 1938. His death was announced Oct., 1946.

**Despoblado** (Span., desert). Treeless, uninhabited plateau of S. Bolivia. On the Chilean and Argentine borders, its estimated altitude is 10,000 ft. to 12,000 ft.

**Despotism.** Term used for a harsh and unpopular form of government. It is derived from the Greek *despotes* (master of the house), and came by analogy to be used for the arbitrary rule of a single man. Gradually an exclusively reproachful idea became attached to the word, and now it is used for any form of government which is oppressive and not in accord with the popular will, whether the despotism of a monarch, a dictator, or a group of people who have secured supreme power in the state. See Democracy; Sovereignty.

**Dessaix, JOSEPH MARIE, COUNT** (1764-1834). French soldier. Born at Thonon in Savoy, Sept. 24, 1764, he became a doctor of medicine. In 1789 he joined the revolutionary army and was soon fighting in Italy and elsewhere. He took part in politics and under Napoleon rose to be a general, and held a command in several of the great battles. In 1814 Dessaix joined Napoleon on his return from Elba, but little more was heard of him until his death, Oct. 26, 1834.

**Dessalines, JEAN JACQUES** (1758-1806). Emperor of Haiti. He was born in Guinea, and taken

as a slave to Haiti, where he became the property of a Frenchman, whose name he adopted. In the revolt of 1790 he took a leading part, and later was made governor of the S. portion of Haiti. On the French being forced to leave the island, he became governor and in 1804 emperor, as Jean Jacques I. He was killed in a revolt, Oct. 17, 1806.

**Dessau.** Town of E. Germany, cap. of the former state of Anhalt. It is on the left bank of the Mulde, near its confluence with the Elbe, 69 m. S.W. of Berlin. Until 1918 it was the residence of the dukes of Anhalt, the chief of whose palaces stands in extensive grounds and contains valuable pictures and antiquities. The Schlosskirche, the most interesting of the churches, has two paintings by Lucas Cranach. The industries of Dessau are sugar refining, making textiles, production of leather and tobacco, and a trade in agricultural produce. Here also was the chief works of the Junkers aircraft and aero-engine company. The 3rd armoured division (U.S. 1st army) entered Dessau on April 21, 1945, towards the end of the Second Great War. Pop. pre-war, 120,732.

**Dessye.** Town of Abyssinia, in the province of Shoa. In April, 1941, the Italian army retreating N. from Addis Ababa made a stand here, but was routed by the South African 1st Brigade, which entered the town on April 26. See East Africa Campaign.

**Desterro.** This city of Brazil is now usually called Florianopolis (*q.v.*).

**Destinn, EMMY** (1878-1930). Czech soprano. She was born at Prague, Feb. 26, 1878, her real name being Kittl, and studied under Lachner and Marie-Loewe.

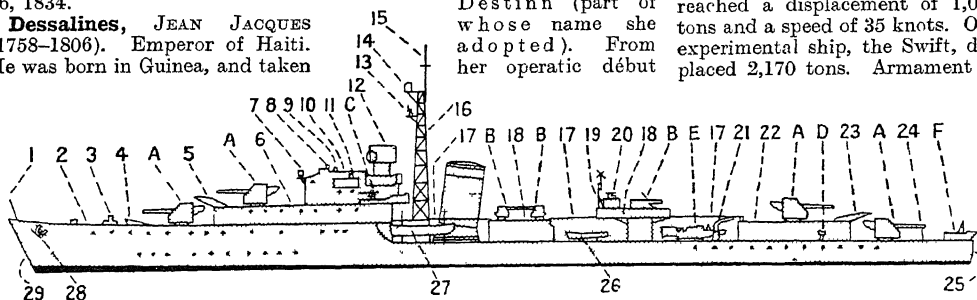
**Destinn** (part of whose name she adopted). From her operatic début

in Berlin in 1898 she at once achieved popularity. Her consummate artistry carried her from triumph to triumph, and she appeared regularly in Germany, England, France, and the U.S.A. She sang in the first production of *Madame Butterfly* (*q.v.*) at Covent Garden, 1905, and in the *Girl of the Golden West* in New York, 1910. After the First Great War she used the name Destinnova. She died Jan. 29, 1930.

**Destroyer.** Abbreviation of the original term, torpedo-boat destroyer, for a useful category of warship. The type first appeared in 1893, and later grew in size and altered its characteristics until it became, in effect, a small cruiser, often called upon to perform duties formerly devolving upon cruisers. In the Second Great War destroyers were the hardest worked ships in the Royal Navy. The largest and fastest acted as a screen for the battle fleet, while the smaller ones escorted convoys in conjunction with frigates and corvettes. In consequence of its high speed and manoeuvrability, the destroyer was also an ideal anti-submarine vessel.

Early British destroyers such as the Havock and Daring, built by Yarrow and Thornycroft respectively in 1893, were of under 250 tons displacement, with a maximum speed of 27 knots. Designed to counter the numerous flotillas of torpedo-boats in the French and Russian fleets, they proved so successful that in a short time they were in every navy. They soon displaced the torpedo-boat as a weapon of attack, and for several years, until the arrival of the submarine, torpedo tubes were regarded as their primary weapon.

At the beginning of the First Great War British destroyers had reached a displacement of 1,000 tons and a speed of 35 knots. One experimental ship, the Swift, displaced 2,170 tons. Armament of



Destroyer. Diagram showing features of a C class destroyer (1,710 tons displacement). A, dual-purpose 4.5-in. guns; B, 40 mm. Bofors A.A. guns; C, 20 mm. Orlikon guns; D, depth charge thrower; E, torpedo tubes; F, depth charge rails; 1, Jackstaff; 2, fore-castle; 3, steam capstan; 4, breakwater; 5, forward blast screen; 6, signal deck; 7, D.F. coil; 8, pelorus; 9, compass; 10, bridge; 11, searchlight; 12, direction tower; 13, anemometer; 14, aerial; 15, tubular steel mast; 16, lattice mast; 17, gangways; 18 Bofors gun platforms; 19, main-mast; 20, director tower; 21, torpedo loading davit; 22, after gun platform; 23, after blast screen; 24, upper deck; 25, stern; 26, motor dinghy; 27, motor cutter; 28, anchor; 29, bow

Courtesy of Thornycroft & Co

the later vessels, except the Swift, consisted of 4-in. guns with a few smaller pieces and either one or two pairs of torpedo tubes. As the result of war experience, the ideal type found in service for many years after 1918 was of 1,100-1,400-tons armed with four 4-7-in. guns and from six to ten 21-in. torpedo tubes. Destroyers with these characteristics took an active part in the Second Great War, which did not produce any considerable variation from standard design until near its close.

Three new types were evolved at length: the C class, of 1,710 tons, with four 4-5-in. guns in single mountings, four 40-mm. and two 20-mm. anti-aircraft guns, and five torpedo tubes; the Weapon class, of 1,980 tons, with six 4-in. guns in twin mountings and several 40-mm. anti-aircraft guns, and ten torpedo tubes; and the Battle class, of 2,325 tons, with four 4-5-in. guns in twin mountings, twelve or fourteen 40-mm. anti-aircraft guns, and ten torpedo tubes. Designed speed was 34 knots in the two former types, 36 knots in the last.

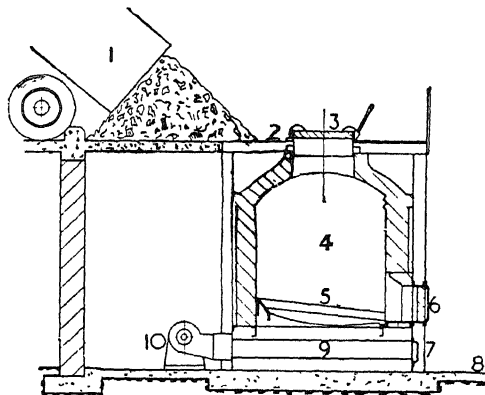
Normal organization of destroyers in the Royal Navy is in flotillas of eight, each flotilla being commanded by a captain (D). In a fleet, four flotillas are grouped together under a rear-admiral, whose flag is usually flown in a light cruiser. All British destroyers carry a hedgehog mortar and depth charge throwers in addition to guns and torpedo tubes. In the past some were fitted for minelaying; and in the U.S. navy some modern destroyers were reclassified as light minelayers or fast minesweepers when fitted for these duties. A recent type of American destroyer is of 2,400 tons, with a speed of over 35 knots and is armed with six 5-in. and twelve 40-mm. guns and ten torpedo tubes.

Destroyers have proved a fine training ground for seamanship. Two distinguished British admirals in the Second Great War, Viscount Cunningham and Lord Tovey, first came to the front in the First Great War as daring destroyer captains. During 1939-45 the Royal Navy lost 138 destroyers, excluding a few irreparably damaged, and the U.S.A. 69.

**Destructor.** A specially designed furnace in which waste in the form of domestic and trades' refuse is destroyed with the least possible nuisance. Fryer took out a patent in 1876 for such a furnace, and also coined the word destruc-

tor. Since matter is indestructible, the word is a misnomer and the title refuse-disposal station appears to be superseding it. The word incinerator usually denotes a small, privately-owned refuse burning outfit, e.g. at hospitals, institutions, and camps.

Satisfactory disposal of civic waste is a duty thrust upon municipal authorities by civilization and remains a continual problem in the interest of public health. Refuse-composition differs considerably from district to district, with the seasons, etc. Average quantities made per 1,000 of population may be put at 15 to 20 cwt. a day. Its calorific value is anything from 2,500 to 6,400



Destructor. Diagram showing cross section: 1, refuse collecting vehicle; 2, feeding platform; 3, feeding door; 4, cell; 5, firegrate; 6, clinkering door; 7, ashpit; 8, clinkering floor; 9, ashpit; 10, air blower

B.Th.U., with moisture content 12-33 p.c. and even more.

It is usual to separate marketable articles before the refuse is delivered into the furnace. Bottles, "cullet," and non-ferrous metals are removed by hand from a conveyor belt. Articles like sacks, carpets, and rags are often collected separately from the main refuse. The reclamation of tins and iron articles is carried out by electro-magnetic machinery, while fine dust and cinders are removed by raking crude refuse across a grid, or passing it through revolving screens. Paper separation is carried out by suction plant. After separation the "tailings" proceed to the furnace for burning. A forced draught is usually necessary to promote combustion; it may be provided by a high chimney shaft, air blowers, or steam jets.

A development of the standard type of furnace is shown in the accompanying illustration. Feeding takes place from the top back

or the front of the plant. An installation consists of cells capable of burning 10-15 cwt. of refuse per hour. Unorthodox types of plant are (1) rotary kiln, in which refuse is incinerated while making its passage through an inclined rotating oven; (2) vertical shaft, like a vertical retort with a funnel at its top for the introduction of refuse, combustion taking place on its way down to a clinker door at the lower end; (3) revolving grate, in which refuse is delivered into an iron brazier, which is subsequently tipped over after the material has been destroyed, the clinker being discharged into a hopper underneath.

The heat produced during combustion is often utilised by passing it to steam boilers, usually of the water-tube type. Steam so generated may drive salvage plant or be used in jets, or for sewage pumping. In some cities electricity is generated on a large scale by destructor-fired boilers. The incombustible constituents of the tailings are reduced to an innocuous clinker. This after treatment may be used for the

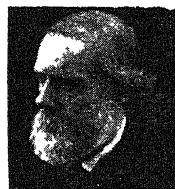
manufacture of asphalt, concrete blocks, etc.; also as a medium for sewage filter beds, and for hard core generally. Flue dust, always present, is intercepted by traps and dust catchers. It has several uses, being employed for lightening heavy soil, as a lawn fertiliser, or in conjunction with carbolic acid as a disinfecting powder.

A. W. Neal, A.M.I.Mech.E.,  
A.M.I.W.E., Assoc.I.E.E.

**Desulphurisation.** In metallurgy, the removal of sulphur from ores. Some of the most important metalliferous ores of the world are represented by the pyrites, which are compounds of metals with sulphur. Gold, silver, copper, nickel, iron, and some other metals are obtained, more or less, from these compounds. Before the metal can be extracted from such ores the sulphur must be removed. In former times this process was accomplished solely by the process of roasting or calcining, but of late years the operation has been

largely effected by direct smelting. See Calcination; Copper; Gold; Iron; Nickel; Pyrites; Silver.

**De Tabley**, JOHN BYRNE LEICESTER WARREN, 3RD BARON



*Warren De Tabley*

(1835-95). British poet. Born April 26, 1835, he was the son of the 2nd baron, whom he succeeded in 1837, this title dating from 1826.

The 1st baron had inherited estates in Cheshire, where was his residence, Tabley House. The 3rd was educated at Eton and Christ Church, Oxford, was called to the bar and entered the diplomatic service, but his main interest was literature. His early works, *Præterita*, 1863, *Eclogues and Monodramas*, 1864, *Studies in Verse*, 1865, and *Philoctetes*, 1866, achieved no wide popularity, but recognition came in 1893 with *Poems, Dramatic and Lyrical*. He died Nov. 22, 1895.

**Detaille**, JEAN BAPTISTE ÉDOUARD (1848-1912). French artist. Born in Paris, Oct. 5, 1848, he studied under Meissonier, and after travelling in Spain and the East, took part in the Franco-Prussian War of 1870. This gave him his opportunity, and he became famous as a painter of military life. *Le Rêve* (The Dream), well known through engravings, and now in the Luxembourg, is one of his most popular works. He died Dec. 23, 1912.

**Detective**. A non-uniformed member of a police force. Plain-clothes detectives are an important branch of the police organizations of most countries. Their duties are mainly to assist in the detection of the authors of crimes, in contrast with that of the prevention of crime which falls upon the uniformed police. There are two chief methods of detective organization, one centralized, by which the activities of detectives are controlled from headquarters, and the other by which each district or town has its own detective force. The former is the Continental system in the main, and the latter the British and American systems. In the U.K. the organizations of the various detective forces are run on very similar lines to that of the Criminal Investigation Department (*q.v.*), or C.I.D., of New Scotland Yard.

The general trend of detective work in all countries is towards

nationalisation as opposed to localisation of effort, and it has been suggested that there should be an international detective force. In practice the latter almost obtains between the U.K. and the Continent. Such a force has become necessary since the increase in means of rapid communication between countries.

In the U.S.A. the detectives of the Federal Bureau of Investigation, which has its headquarters in Washington and branch offices in large cities, cover not only matters of internal security but many other crimes, *e.g.* bank robberies, kidnapping, theft of government property and of motor vehicles. Each state and all large centres of population maintain their own police and detective service.

In Berlin, after 1876, when the detective system was reorganized, there were specialised detective groups which dealt exclusively with one type of crime each. There was a special murder commission for all murder cases. High specialisation, however, did not prove so successful as the decentralised British system. In Paris and France generally the organization of the C.I.D. was more nearly followed after 1913.

Throughout the U.K. and the Continent and in the U.S.A., detectives are usually promoted from the uniformed force. Experience has shown that a man does not become an efficient detective without previous training as a uniformed constable. Sir Howard Vincent, who tried the experiment at New Scotland Yard in 1878, stated that it proved unsatisfactory. See Bertillon Measurements; Criminology; Police; Police Staff College; Scotland Yard.

**Detective Fiction**. The detective story, long or short, is one in which the main interest lies in the investigation and solution of a crime mystery by scientific detection, professional or amateur. E. A. Poe, with *The Murders in the Rue Morgue*, 1841, and other stories, is generally regarded as the father of the detective story. Later in the 19th century Émile Gaboriau (*The Mystery of Orcival*), F. du Boisgobey, and Gaston Leroux (*The Mystery of the Yellow Room*) in France, and Conan Doyle in England, with his stories of Sherlock Holmes, helped to formalise this type of fiction into an art of its own, with its own rules and conventions. As such it became widely popular as the 20th century progressed. E. C. Bentley with *Trent's Last Case*, 1912, a classic

of detective fiction, and G. K. Chesterton with his fantastic stories of Father Brown, set new literary standards for the art; and between the two Great Wars it became highly developed in the hands of such writers as (in England) Dorothy L. Sayers, J. J. Conington, G. D. H. and M. Cole, Agatha Christie, F. Wills Crofts, H. C. Bailey; in America, Ellery Queen and S. S. Van Dine; in France, Simonon. Many other established writers have made at least one excursion into the art. Usually Conan Doyle's practice was followed of using the same strongly characterised detective for an illimitable number of problems, *e.g.* Sayers's Lord Peter Wimsey, Christie's Hercule Poirot, Van Dine's Philo Vance, Simonon's Maigret.

The true detective story is in effect an entertaining challenge to the reader to solve the given problem earlier than the hero, for in the best examples of the art all clues, as well as all "red herrings," are laid fairly before the reader as before the fictional detective, and the correct solution is inherent in the initial statement of the problem, no reliance being placed on chances or surprises in the plot. This appeal to the brain distinguishes the detective story proper from the mere "thriller," which appeals first to the emotions. Nevertheless detective fiction is essentially romantic and "escapist," possessing the old virtue of romance that the hero is always on the side of the angels and, moreover, always triumphs.

**Detector**. In warfare, device employed to give warning of the presence of poison gas or to locate mines and submarines. Chemically treated strips of paper were prepared during the Second Great War to detect the invisible and odourless German gas arsine, which turns white paper a dull brown. Half-sleeves and sheets of metal were painted with gas-detecting paint which would have disclosed by reddish spots the presence of liquid gas. Gas paint was also applied to the sleeves of gas capes, tops of pillar boxes, etc.

Electronic detecting devices located buried land mines. In an electro-magnetic detector invented by a Polish officer, the circular shoe at the end of a long arm was swept over the ground at a height of about 4 ins. and a steady note was transmitted to an operator with earphones; the presence of a mine was indicated by the note becoming shrill. The Germans and



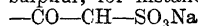
Italians defeated the detector for a time by putting their mines in a wooden box. Marine acoustic mines were located and exploded by the hammer-box detector; this sent pulsations through the water, which depressed the firing diaphragm of the mine, causing it to detonate at a safe distance from the vessel.

The mine detector, carried in front of a vehicle on a boom, locates underground pipelines and cables. Sub-surface flaws in castings or forgings are revealed by electronic detectors employing

foreign influence or control. See Defence Regulations.

**Deterding**, SIR HENRI WILHELM AUGUST (1866-1939). Anglo-Flemish industrialist. He was born in Amsterdam, and as a comparatively young man made a fortune. A naturalised British subject, he became director-general of the Royal Dutch Petroleum Company, 1896, a position he retained until his death. One of the most influential figures in the oil industry in Europe and in the U.S.A., where he owned 375 sq. m. of oilfields, he was also

containing oxygen, sodium, and sulphur, for instance:



$-\text{CO}-\text{CH}_2$  has an attraction for water; a chain such as  $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2$  has an attraction for fatty or greasy particles, and a detergent containing such a group and such chains can break up dirty or greasy compounds so that they can be washed or wiped away. Detergents are used in the treatment of textile materials, in the preparation of drugs, cosmetics, and emulsions, and in electroplating.

**Determinant.** A convenient notation for representing certain algebraic functions or expressions. Determinants were first suggested as a result of the solution of a system of simple algebraic equations. In the solution of three simple equations of the form  $ax + by + cz = d$ , for example, the elimination of  $y$  and  $z$  gives us for the coefficient of  $x$

$$a(b_1c_2 - b_2c_1) + a_1(b_2c - b_1c),$$

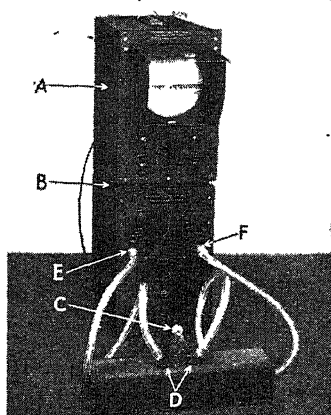
which is usually written in the determinant form

$$\begin{vmatrix} a & a_1 & a_2 \\ b & b_1 & b_2 \\ c & c_1 & c_2 \end{vmatrix}$$

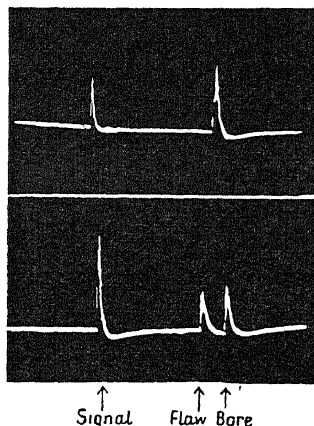
Consult Theory of Determinants, T. Muir, 1882.

**Determinant.** An aggregate of hypothetical biophores whose presence, according to Weismann (1834-1914), determines the characters of a cell. Weismann supposed determinants to be grouped into ids which he identified with granules of chromatin to be seen in the nuclear reticulum and sometimes in chromosomes. According to his theory, both parents contribute different kinds of determinants to the fertilised egg. As this egg grows into a new individual by cell division, the successive nuclear divisions result in the distribution of the determinants to the various cells, so that each comes to have a collection of biophores which cause it to assume its special characteristics. The theory is antiquated, but the term is still used in a general way to denote that heritable matter which causes a character of an individual to appear.

**Determinism.** The theory that all events are consequences of antecedents which account for them in every particular. In philosophy and psychology it means the belief that human behaviour, and in particular moral decisions, are decided by the heredity, past



Detector. Supersonic flow detector for revealing sub-surface flaws in castings or forgings. Left, the instrument: A, cathode ray unit; B, control unit; C and D, thumb screw and adapting wedges for flat surface; E, receiver socket; F, transmitter socket. Right, oscillograms from cylindrical forging: (top) reflection from central bore; (below) reflection also from a flaw



supersonic frequencies. Flaws and defects can be detected 10 ft. from the unit. The magnetic airborne detector, invented during the Second Great War by U.S. scientists as an aerial U-boat detector, was suspended on a cable below an aircraft and free from any magnetic influence from it. Delicate electrical instruments detected any submerged metallic object and transmitted a signal to the receiver in the aircraft. This device was used after the war for locating minerals under the earth.

**Detention Orders.** Powers given to the British executive, in both Great Wars, to detain persons without trial when necessary in the national interests. In the Second Great War, Defence Regulation 18B authorised the Home secretary to detain anybody on reasonable belief that he was of hostile origin or associations or had been recently concerned in acts prejudicial to the public safety; or even if he was a member of certain organizations subject to

a director of the Shell Transport and Trading co. He was knighted 1920, and died Feb. 4, 1939.

**Detergent.** Cleansing agent depending for its effect on surface tension (*q.v.*) and interfacial tension (*q.v.*) in breaking up or altering oils and fats and emulsions of these and water or aqueous liquids. Soaps are detergents consisting of sodium and potassium salts of fatty acids; as fats and oils are required for food, synthetic detergents are made from other sources. These not only avoid the use of fats; they are more efficient and convenient to use, and hundreds are on the market under trade names. Some are mixtures of specially chosen alkaline substances, but at least 500 detergents are esters (*q.v.*) of organic sulphonic acids.

These esters consist of long chains, at one end of which is a group often containing carbon, sulphur, oxygen, sodium, and hydrogen; the remainder has perhaps a dozen groups of  $\text{CH}_2$  or something similar. The group



history, and character of the individual, taken with the circumstances in which he finds himself. (as antithesis is Free Will (q.v.).

**Detinue** (Lat. *detinere*, to hold back). In English law, an action for the wrongful detention of chattels. An order can be made for the delivery of the property to the true owner, and for damages for detention, or for damages alone—being the whole value of the property. The owner must demand the property before he can claim in detinue. *Prom. detty-new*.

**Detmold.** Town of W. Germany, in the *Land* of North Rhine-Westphalia. It stands on the Werre, 48 m. S.W. of Hanover, at the E. edge of the Teutoburger Wald. Until 1918 it was the residence of the princes of Lippe-Detmold, whose palace, a 16th century Renaissance building, is the chief edifice. Near it is the new palace (17th century) in a large park. There are several churches, a natural history museum, schools, etc. The chief industries are cigar making and brewing, while marble and gypsum are worked in the vicinity. Pop. 17,800.

**Detonating Fuse** or **CORDEAU DETONANT** (Lat. *detonare*, to thunder.) Appliance for the instantaneous transmission of detonation to one or more explosive charges, and also for purposes of demolition. By 1879 a detonating fuse was in use in the French army. It was prepared by filling a lead tube with nitro-hydrocellulose in powdered form and then subjecting it to wire-drawing until the diameter was reduced to 4 mm. Its rate of detonation was about 4,000 metres per sec., but it was somewhat sensitive to impact and difficult to manufacture.

An Italian fuse prepared in a similar way used ballistite in place of the nitro-cellulose. Gunpowder is occasionally added to the ballistite. When ignited with a flame this fuse burns at the rate of 4 mins. per metre, but when detonated its velocity is 5,000 metres per sec.

The modern detonating fuse may be said to have had its birth when the French experimented with tin tubes filled with cast picric acid, the diameter being subsequently reduced by wire-drawing. Lead tube could not be used owing to the formation of lead picrate, a highly sensitive compound, and tin tubes were somewhat brittle, and inclined to deteriorate on storage. The rate of detonation was 6,900 metres per sec. At present a detonating

fuse is generally charged with trinitrotoluene or penta-erythritol tetranitrate, the former usually filled into lead tubes and the latter into tubes of woven fabric. A lead tube of 1 in. diameter is charged by drawing the molten explosive into it by means of a vacuum. The tube is then drawn down to either a round or oval section, the diameter being either 4 or 5 mm. The finished product is quite pliable. The initiation of a detonating fuse is effected with a detonator which may be fired with a length of safety fuse or electrically, the velocity of detonation being about 6,000 metres per sec.

The appliance is frequently used to transmit detonation to a distant charge instantaneously, this fuse being simpler to lay and often more reliable than electric connexions in warfare. It can be used to destroy obstacles, as a turn of the fuse round a wooden post or iron stake is sufficient to cut right through it on detonation. Industrially it is used for firing a number of charges simultaneously, and for the detonation of charges in bore holes; it is much more effective with insensitive explosives than an ordinary detonator. In testing high explosives their velocity of detonation is frequently measured with the help of this fuse, which eliminates the necessity of an expensive and delicate chronograph.

**Detonation.** Phenomenon of chemical transformation. Whereas explosives like gunpowder, gun-cotton, cordite, etc., when lit by a flame in the open air, burn quietly and at different rates, others, such as mercury fulminate and lead azide, explode with great violence when ignited. The explosion is accompanied by intense shock (pressure) waves; in a column of explosive the shock wave forms an explosive front which travels through the mass at a velocity from 3,000 to 9,000 metres per second. The temperature in the shock wave may rise to about 10,000° C. This wave is known as a detonation wave and the explosion resulting as a detonation. Explosives which detonate on heating or by a violent blow are known as primary or initiatory explosives. High explosives are usually detonated under the influence of the shock from a primary explosive (detonator). Several experimental methods are used for measuring the velocity of detonation, which is influenced by the physical state, density, and degree of confinement of the explosive. (See Explosives.)

Detonation is also the name given to the "pinking" sound heard during the running of petrol engines in certain conditions. When a spark passes at the plug, combustion is initiated and proceeds outward in an approximately spherical wave. The hot combustion products expand rapidly and compress the remaining mixture until it is raised in temperature to ignition point, when the whole explodes, setting up waves which strike the cylinder walls with great force. These waves may set up pre-ignition by overheating the plug. Detonation is distinguished from pre-ignition in that it takes place *after* the spark has passed. It is accentuated by high compression ratios, and may be reduced by high turbulence and special shaping of the combustion chamber.

**Detonator.** Small charge of a violent explosive suitable for convenient handling and possessing the necessary properties for initiating detonation in other explosives. Fulminate of mercury was solely employed for this purpose until comparatively recent times, but now it is being displaced to some extent by lead azide. Both these sensitive explosives can be detonated by heat or percussion, and communicate detonation to any high explosive. Detonators consist of copper cylinders, closed at one end, into which the composition is pressed, and for commercial use are made of various sizes, in which the weight of the charge varies to suit different explosives, the internal diameter being arranged to accommodate one end of a length of safety fuse.

Modern detonators frequently contain a high explosive such as tetryl or trinitrotoluene in the closed end, and a layer of fulminate above it. Owing to the sensitive nature of the ingredients, detonators are generally filled by machinery operated by a worker from behind a screen. In use, the detonator is embedded in the charge and ignited by a safety fuse to which it is crimped, by the heating of a thin wire embedded in the composition in the case of electric detonators, or by percussion in the case of projectile fuses. With very insensitive explosives the detonator is frequently placed in a small charge of more sensitive material, which is called a primer; this in turn is in contact with the main charge, so initiating the train of detonation.

A generally accepted series of detonators of standard strengths

is numbered 1 to 10, containing the following amounts of a filling composed of 80 p.c. mercury fulminate and 20 p.c. potassium chlorate.

Number	Charge (gm.)
1	0.3
2	0.4
3	0.54
4	0.65
5	0.8
6	1
7	1.5
8	2
9	2.5
10	3

The less sensitive explosives require detonators with the higher numbers. See Fuse.

**Detroit.** River between the U.S.A. and Canada. Issuing from Lake St. Clair, it forms part of the E. boundary of Michigan and the W. of Ontario, and flows S. into Lake Erie. Navigable by the largest vessels, it is 27 m. long and 3 m. wide at greatest. Forming one of the finest harbours on the Great Lakes, it is probably the world's busiest inland waterway. There are many ferries, and beneath it a rly. tunnel from Detroit, Mich., to Windsor, Ont. The name is derived from Fr. *étroit*, narrow.

**Detroit.** Fourth largest city of the U.S.A. It is in Michigan, the co. seat of Wayne co., and extends 26 m. along the N.W. shore of the Detroit river, facing Windsor in Canada, with which it is connected by rly. tunnel under the river. The city is 18 m. above Lake Erie, near the S.W. end of Lake St. Clair. The world's greatest inland waterway in volume of tonnage, the river (v.s.) forms a safe and sheltered harbour. Detroit is 272 m. E. of

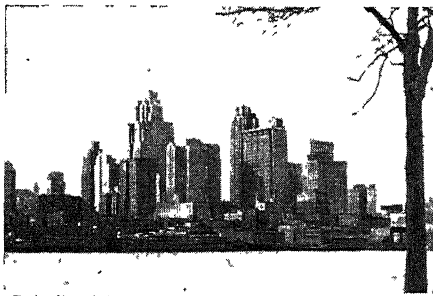
Chicago and 690 m. W. of New York, and the terminus of several rlys., e.g. Michigan Central, New York Central, Canadian Pacific.

Although visited by La Salle in 1648 and again in 1670, Detroit was not settled until 1701, by Antoine de la Mothe Cadillac, a French colonial governor, as a trading station in New France. It became British in 1760, afterwards alternately American and British, and finally American in 1813. Receiving its city charter in 1824, it was the state capital until 1847, when the seat of administra-

tion was removed to Lansing. Government is by mayor and council. There are Episcopal, R.C., and Methodist bishops.

World famous as the centre of the U.S. motor industry, the factories of Detroit include those of Cadillac, Chrysler, Ford, and Packard. In 1946 it was estimated that the industry would soon produce 5,000,000 cars annually. A shipbuilding centre, Detroit also makes iron and steel goods, structural and decorative ironwork, foundry and machine shop products, machine tools, and electrical appliances, and trades in flour, grain, and dairy products. It covers 142 sq. m. and was planned and built in concentric semi-circles, with a checker-board development of streets. Notable buildings include those of Ford and General Motors, Penobscot building, U.S. government building, and Henry Ford hospital, one of the finest in the country. Educational institutions include Wayne university, the university of Detroit, the Detroit college of surgery and medicine, the Detroit college of law and Detroit teachers' college. The city possesses a renowned institute of art.

During the Second Great War, Detroit, where America's first all-metal planes were produced, became a centre of the aircraft



Detroit, Michigan. Skyscrapers of the city seen from the Canadian shore of the Detroit river

industry. The plants of Ford, General Motors, and Chrysler were converted for war purposes, and Willow Run and other homes of assembly-line mass production sprang up here. In 1941 the city turned out the majority of the 4,838,561 passenger cars and trucks made in the U.S.A. Pop. 1,625,452.

**Dettingen.** Village of Bavaria. It stands on the Main, 10 m. N.W. of Aschaffenburg, and on the rly. to Frankfurt-on-the-Main. The battle fought here in 1743 was the last in which an English king took part.

**Dettingen, BATTLE OF.** Fought June 27 (N.S.), 1743, between the English and Hanoverians on one side and the French on the other. Supporting Austria in the war of the Austrian Succession that began in 1742, an English army, under Lord Stair, advanced on Aschaffenburg-on-the-Main, near which point, but on the other side of the river, a French army had already arrived. Unable to induce the Austrians to combine in engaging the enemy, Lord Stair decided to withdraw to Dettingen, but reached it to find himself anticipated by the French, who had outmarched him along the opposite bank and crossed the river. Battle was now inevitable.

King George II, who had arrived, was in command of the army of 42,000 English, Austrians, and Hanoverians. The French, numbering about 50,000, under the duc de Noailles, held the bridges and were protected by guns from the other side of the Main, and also by the marshy ground in front. Impatient, however, at the allies' delay in opening battle, the French commander abandoned this advantage of position and flung his cavalry against the British infantry. Despite initial successes won over them, the infantry stood firm, and the English king then led his own foot forward and decisively defeated the French, who were routed with a loss of over 3,000, as compared with about half that number on the allies' side. To celebrate this victory Handel composed his *Dettingen Te Deum*.

**Deucalion.** In Greek mythology, son of Prometheus and king of Phthia in Thessaly. When Zeus, shocked at the impiety of mankind, determined to destroy the human race, Deucalion was advised by his father to construct a ship for himself and his wife, Pyrrha. Zeus sent a flood which overwhelmed all living creatures except Deucalion and Pyrrha, whose vessel, after nine days tossing on the flood, stopped on the top of Mount Parnassus. When the waters had subsided, Deucalion consulted an oracle as to how the earth could be repopulated, and he and his wife were bidden to throw the bones of their mother over their shoulders. Taking this to refer to mother earth, they threw stones behind them, which became men and women. By Pyrrha, Deucalion was the father of Hellen, the founder of the Hellenic race who inhabited ancient Greece.

**Deus ex Machina** (Lat., a god from a machine). In Greek drama, gods and goddesses were introduced upon the stage on a cradle or scaffolding lowered from the top by ropes, in order to bring the plot to a dénouement. The intervention of superhuman agency was apt to be too frequently employed, Euripides in particular being regarded as an offender. The expression is currently used to denote anyone who brings unexpected relief from an embarrassing situation.

**Deus Misereatur** (Lat., God be merciful). First words in the Vulgate of the 66th psalm (67th in the English Prayer Book). In 1552 this psalm was appointed to be sung as an alternative canticle to *Nunc Dimittis* (*q.v.*) at evensong, and still may be, unless used among the psalms for the day. It did not appear in the medieval vespers or compline. It is also sometimes used as an alternative to the 128th psalm in the marriage service.

**Deuterium**. The isotope of ordinary hydrogen formed by combination of a neutron and a proton. It is often referred to as heavy hydrogen, for its mass is twice that of the ordinary hydrogen atom; about one in every 5,000 hydrogen atoms is of this variety. The existence of deuterium was discovered by Urey, using a spectrograph, and the earliest method of preparation was by electrolysis of water. The ordinary hydrogen is liberated as a gas and the deuterium is left behind in the liquid. After numerous repetitions of the process, water containing a strong concentration of heavy hydrogen is obtained (heavy water). Deuterium atoms are of great value in "atom smashing," for they provide an "atomic bullet" twice as heavy as an ordinary hydrogen nucleus without an additional nuclear charge. See Nuclear Physics.

**Deuteronomy**. The fifth book of the Pentateuch, or rather Hexateuch. The title, taken from the Septuagint (Deut. 17), means "second Law," and is due to a wrong rendering of Hebrew words which really mean "a copy of this law." The Hebrew title is "Words" or "These are the Words." Deuteronomy contains one of the three chief codes of Hebrew law (Deut. 12-26 in particular). This is preceded by a retrospective and hortatory address by Moses (Deut. 1-11), delivered in the land of Moab, and is followed by an account of the last

days of Moses (Deut. 27-34). In the latter section are incorporated two long poems, the Song of Moses (Deut. 32), and the Blessing of Moses (Deut. 33). Of these the Blessing of Moses is a much earlier composition. See Hexateuch.

**Deutsche Allgemeine Zeitung**. German newspaper. It took this name after the First Great War, having been the Norddeutsche Allgemeine Zeitung. Founded 1861, it was from 1862 Bismarck's organ; during 1920-24 it was owned by the Ruhr industrialist Hugo Stinnes, then by the republican government, then by magnates. Of Liberal National outlook, it was one of the few non-Nazi papers tolerated by Hitler; it did not actively oppose him.

**Deutsche Rundschau**. German monthly magazine, on the pattern of The Contemporary Review, etc. Founded 1874 by Julius Rodenberg, it had Theodor Storm, Count Moltke, Anastasius Grün, Heinrich von Sybel, and other great Germans as contributors. After the First Great War Rudolf Pechel edited it, with contributors such as Thomas Mann and Ivan Bunin. Suppressed by the Nazis, it was one of the first German periodicals resurrected in 1946, again under Pechel.

**Deutschland**. German pocket battleship, later renamed Lützow. Originally the name-ship of the "pocket-battleship" (*q.v.*) class to which the Admiral Scheer and the Admiral Graf Spee belonged, she displaced nearly 15,000 tons; had a complement of 926; six 11-in. and eight 5.9-in. guns, and eight 21 in. torpedo tubes. She seized the U.S. freighter City of Flint (*q.v.*) in Oct., 1939, and sank the British auxiliary cruiser Rawalpindi (*q.v.*) off Iceland in Nov. During the intense naval activity off Norway, she was beached 50 m. W. of Trondhjem on April 25, 1940. In June, 1941, as the Lützow, she was reported damaged by the R.A.F. when trying to escape into the Atlantic. Torpedoed by midget submarines in Alten Fjord, Sept., 1943, she was sunk by the R.A.F. at Swinemünde, April 16, 1945.

**Deutschland über Alles** (Ger., Germany over all). National song in praise of German supremacy. It was written in 1841 by A. H. Hoffmann von Fallersleben and published in 1848 in a collection of German folksongs. It is commonly sung to the tune of the Austrian Hymn to the Emperor, composed by F. J. Haydn, 1797.

**Deutzia**. Flowering shrub. Member of the family Saxifragaceae, it is of oriental origin. In Britain it is a favourite greenhouse plant, bearing masses of white flowers, while *D. scabra* flourishes out-of-doors.

**Deux Sèvres**. Department of France. In the W. of the country, the dept. of Vendée separates it from the sea. It is divided into three regions, the Marais, the Plaine, and the Gatine. On the whole it is flat, although there are hills in the centre. The chief rivers are the Sèvre of Niort, the Sèvre of Nantes—hence the department's name—the Charente, and the Thouet. In the S. the soil is very fertile, elsewhere it is less so. Considerable crops of wheat, oats, and potatoes are grown, and horses and cattle are reared. Beet, flax, vegetables, and fruit are also cultivated. Niort is the capital. The dept. has an area of 2,337 sq. m. Pop. 312,756.

**De Valera**, EAMON (b. 1882). Irish statesman and *taoiseach*. Born in New York of a Cuban-Spanish father and an Irish mother, he was brought to Ireland at the age of three. He was educated by the Christian Brothers at Charleville (now Rathluire), co. Limerick; at Blackrock College; and at the old Royal University of Ireland, where in 1904 he graduated in mathematical science. For a time he considered becoming a priest, but decided that his vocation lay in schoolmastering. Becoming an Irish language enthusiast, he joined the Gaelic League (*q.v.*), 1908, and married his Irish teacher, Janie O'Flanagan.

He was soon caught up in the rising tide of Irish nationalism, and in 1913 joined the Irish Republican Brotherhood, a powerful secret society under the ban of the R.O. hierarchy. After the insurrection of Easter, 1916—in which his "troops" holding Boland's mill in Dublin were the last rebels to surrender—he was sentenced to death by a British military court, the sentence being commuted to one of penal servitude for life. Imprisoned in Dartmoor and elsewhere in England, he was released in 1917 on being chosen Sinn Féin candidate for E. Clare; and although almost entirely unknown to the public, he



Eamon De Valera,  
Premier of Eire,  
1932-48

was elected president of the Volunteers and of Sinn Féin.

Arrested next year and removed to Lincoln gaol, he made with two companions a sensational escape; returned in secret to Dublin; was elected president of Dáil Éireann (*q.v.*), the illegal Irish parliament; formed a "ministry" which included Arthur Griffith (*q.v.*) and Michael Collins (*q.v.*); and escaped to the U.S.A., where for 18 months he collected funds and vainly tried to obtain official recognition for the Irish republic.

In 1921, at the election after the Government of Ireland Act had parted six of the Ulster counties from the rest of the country, he was elected Republican representative to Westminster for both S. Down and E. Clare, but did not take either seat. Despite the signing in London on Dec. 6 of the Anglo-Irish Treaty, De Valera, who did not attend the final negotiations, refused to recommend the Treaty to the Dáil, which, nevertheless, on Jan. 7, 1922, approved it by 64 votes to 57. Civil war soon broke out, was quelled by the firing squad, and under the leadership of W. T. Cosgrave (*q.v.*) the Irish Free State government settled down to constructive tasks.

In 1926, on being repudiated by the I.R.A. and Sinn Féin, De Valera formed a new party, Fianna Fáil, and the following year, taking the oath of allegiance to the British crown as required of all deputies by the treaty, entered the Dáil at the head of a party holding 44 seats as against Cosgrave's 46. When in 1932 Fianna Fáil came to power, De Valera realized his ambition to abolish the oath. In 1937 he dispensed with the governor-generalship, reconstructed the senate, and introduced a new constitution (in which the name Éire appears for the first time to designate the 26 Southern Irish counties), establishing a two-chamber parliament consisting of Dáil and senate, with a president and *taoiseach*.

He was president of the League of Nations council in 1932 and of the assembly in 1938. During the Second Great War—when both Allied and Axis diplomats continued to function in Dublin—he pursued a much-criticised policy of neutrality. His party was returned with an absolute majority in the Dáil in 1944; but though still the strongest after the 1948 elections was in a minority. De Valera, having set his face against coalition, was voted out of office Feb. 18.

H. L. MORROW

**De Valois**, NINETTE (b. 1898). Anglo-Irish choreographer. Born at Blessington, co. Wicklow. June 6, 1898, her real name being Edris Stannus, she was a pupil of Cecchetti (*q.v.*) and danced in the Lyceum pantomime of 1914, appearing annually at that theatre until 1919. A member of the Diaghilev company 1923–26, she then became choreographic director to the Old Vic productions of opera and ballet, 1926–30. With the establishment of a permanent ballet school at Sadler's Wells, 1931, she achieved a unique position as director of contemporary English ballet. Her chief choreographic works include *The Gods Go A-Begging*, *Job*, *The Rake's Progress*, *Checkmate*, *Promenade*. She published *Invitation to the Ballet*, 1937. In 1947 she was created C.B.E.

**Devaluation**. Term formerly used for the lowering of the amount of gold in the standard coin of a country, resulting in a decrease of its purchasing power abroad. It has, since the issue of gold coins virtually ceased, come to mean the lowering of the credit value of the currency of one country in terms of the currency of another, e.g. of the £ in terms of the \$, 1949.

**Devanagari** (town-writing of the gods). Name given to the form of the Indian alphabet usually employed in writing Sanskrit. It consists of 50 letters, 36 consonants and 14 vowels, and there are numerous combinations of signs. It is of Semitic origin and acquired predominance in India in the 11th century A.D. It was officially adopted by the Indian govt. as the script for Hindi in 1949.

**Developer**. Substance used in photography for rendering visible the latent image formed by the action of light on the sensitised plate or paper. Most chemicals used for this purpose are hydrocarbon derivatives, and a complete developing solution commonly contains, together with the reagent, sodium carbonate as an accelerator, a bromide as a preservative. See *Hydrokinone*: *Metol*; consult also *Developing*, C. I. Jacobson, rev. ed. 1944.

**Development Area**. Name applied after the Second Great War to any region of Great Britain formerly known as a Special Area or a Depressed Area (*q.v.*).

**Development Commission**. Body established by the Development and Road Improvement Funds Acts of 1909 and 1910. It normally consists of eight commissioners (appointed by royal

warrant) of whom the vice-chairman is paid. The Act of 1909, as affected by subsequent legislation, empowers the Treasury, on recommendation of the development commissioners, to make advances by grant or loan to govt. depts., public authorities, universities, colleges, schools, institutions, or associations not trading for profit, for the following purposes in Great Britain: agriculture and rural industries, reclamation and drainage of land, construction and improvement of fishery harbours, improvement of fisheries. The commissioners derive their funds from an annual sum voted by parliament. The offices are at 6a, Dean's Yard, London, S.W.1.

**Development Council**. See N.V.

**Devenish**. Island in the lower Lough Erne, N. Ireland, famous for its remains. It is 2 m. from Enniskillen. The remains include a fine round tower, a cross in good condition, and the ruins of an abbey and of the church of S. Molaise. The whole is preserved by a public authority.

**Deventer**. Town of Holland, in the prov. of Overijssel. It stands at the junction of the Yssel and the Schipbeek, 66 m. E.S.E. of Amsterdam. An old place, it has the Gothic Groote Kerk, with its 11th century crypt, the Berg Kerk of the early 13th century, and the town hall. The weigh house, a 16th century edifice, is used as a school, and there are some fine old private houses. The Brink is a fine square, and a 17th century Renaissance building is now the police headquarters. The town library has some valuable manuscripts, and until 1876 Deventer had a famous school, its Athenaeum. The chief industries are the making of a kind of gingerbread, called *Deventer Koek*, the manufacture of carpets, and iron founding. It also has a trade in agricultural produce. Tramways connect it with Zutphen. Deventer belonged to the bishopric of Utrecht before passing about 1600 to the Netherlands. Here Groot, the founder of the Brothers of the Common Life (*q.v.*), was born and Erasmus was educated. On April 11, 1945, the Canadian 3rd division captured Deventer from the Germans, who had destroyed the road and rly bridges over the Yssel. Pop 40,309.

**Devers**, JACOB LOUCKS (b. 1887). American soldier. Educated at West Point military academy, and commissioned in the field artillery 1909, Devers was an artillery

instructor at Fort Sill, Oklahoma, during the First Great War, and later an instructor at the military academy. He was sent to the Panama zone in 1939 in charge of mechanisation of the defences. Promoted lieutenant-general in 1942, he was commander of the U.S. forces in the European theatre of operations in May, 1943, and deputy commander in the Mediterranean in Dec. He led the Allied landings in S. France on Aug. 15, 1944, and in Sept. was given command of the 6th army group. Devers was promoted general March 13, 1945; on May 5 received the surrender of the German 1st and 19th armies; and on Aug. 4 became commanding general U.S. army ground forces.

**DEVI** or **MAHADEVI**. Hindu goddess, wife of Siva. She is sometimes represented as a beautiful woman riding on a tiger, sometimes as black-skinned, with a terrible and hideous countenance, streaming with blood, encircled with snakes, hung round with skulls and human heads. Human sacrifices were offered and orgiastic rites performed in her honour.

**Deviation** (Lat. *de*, from: *via*, way). In navigation, effect of the ship's metal hull and machinery on the mariner's compass. If the structure of the hull did not affect the compass, the needle would point to the magnetic pole; actually the attraction of the hull diverts the needle from true position. To overcome this, the compass is placed well above the main deck, with magnets and soft iron around it. A table then gives the deviation for various positions of the ship's head.

**Device** (late Lat. *divisa*, division, drawing). Heraldic term for a motto with its pictorial or emblematic design. Unlike a crest, the device is personal and need have no connexion with the armorial bearings of its user. It is not borne upon the shield or crest and has no heraldic value. The term is frequently misapplied, however, to a crest or charge.

**Devil** (Gr. *diabolos*, accuser, slanderer). Name given generally to evil spirits, but more particularly to Satan, the Hebraic prince or chief of the powers of darkness.

Among the Jews, the idea of a personal enemy outside the human race appears to have arisen very early. The story of the Creation in the opening chapters of Genesis is free from the traditions of a conflict between good and evil which are to be found in other early cosmogonies; but the idea

appears in the story of the first human beings in the Garden of Eden. Here the evil spirit assumes the form of a serpent inviting Eve to disobey the divine command. This association of the serpent with the powers of evil had been general among primitive races, and is probably due to the dread inspired by the silent movements and deadly attacks of the reptile.

After the Eden story, there is no clear reference to a personal devil until the post-exilic period, the allusions to evil or lying spirits indicating rather a state of mind or temporary tendency than anything personal and exterior to the individuals concerned. But after the Exile Jewish writers concentrate the hostile influence in a great personality whom they call Satan, or the adversary. He is described as opposing God and yet as in some degree subservient to him. Thus in the Book of Job he is represented as asking the divine permission to test the genuineness of the patriarch's religion. This view is probably due to influence of Persian thought upon the Hebrew exiles. The Parsee, or ancient Persian religion, taught that the universe was created by two rival powers, Ormuzd and Ahriman, or light and darkness, the latter being inferior but not subordinate to the former.

#### Fallen Angel Theory

The Jewish and Early Christian tradition of the origin of Satan is that he was originally one of the angels, and became the leader of a party which revolted against God's supremacy. He and his party were then attacked by Michael and the other angels and defeated.

After being cast out of Heaven Satan is represented as not merely the opponent of God but as the malignant enemy of man. He acts chiefly by tempting man to indulge his natural and evil propensities in defiance of the known will of God. In N.T. times he was believed to have power over the bodies of those who abandoned themselves to evil. There are many records of persons possessed by devils and thereby made lunatic or diseased (see Demonology: Demonic Possession).

The various names given to the devil in Holy Scripture are significant of the various conceptions of his attitude and power at different epochs. He is most generally styled Satan or the adversary, and the devil or the slanderer. The Hebrew name Abaddon, perdition, becomes in the N.T. Greek Apollyon, the destroyer. Beelzebub, the Lord of Flies, was an adaptation of the

name of a Philistine deity: but it is doubtful if Belial, worthlessness, was used in a personal sense by the O. T. writers. The name Dragon is applied to the devil eight times in the book of Revelation and is probably a development of the older idea of the serpent. The name Lucifer is often applied to Satan; but it occurs in only one place in the Bible (Is. 14, v. 12) and obviously refers to the king of Babylon.

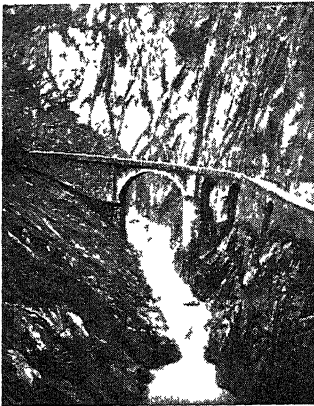
While rationalism rejects entirely the belief in a personal devil, the widest and most varied beliefs on the subject prevail in the Anglican and Nonconformist Churches. The R.C. Church teaches officially that a malignant intelligent being called the devil was, with other spirits, originally created good by God, but became evil by its own acts; that the devil subsequently tempted man to evil, and that man fell; and that the devil continues to tempt mankind to evil, and must be resisted.

**Devil's Advocate** (Lat. *advocatus diaboli*). Name given in the Roman Catholic Church to the person appointed to bring forward all the objections that can be stated to the proposed canonisation of a saint. His official title is *promotor fidei* (promoter of the faith), and the office was created in the 16th century. The term has come to be applied to anyone arguing, though not necessarily believing, the worst that can be alleged against a person or cause.

**Devil's Beef Tub**. Name of a deep hollow in Dumfriesshire, Scotland. In hilly country, about 5 m. N. of Moffat, it is also known as the Marquess of Annandale's Beef Stand. Scott made it the scene of an exciting escape in *Redgauntlet*.

**Devil's Bridge**. Hamlet of Cardiganshire, Wales. It is 11½ m. by rly. E.S.E. of Aberystwyth. It derives its name from a double bridge spanning the Mynach: the lower bridge was erected by the monks of Strata Florida Abbey in the 11th century, the upper in 1753. There is also a modern iron bridge. Waterfalls are seen on all sides of the river gorge.

**Devil's Bridge**. Famous bridge in Switzerland. It is in the canton of Uri, on the route from the Reuss valley to Airolo, Italy, via the St. Gotthard pass. It crosses the Reuss between Goschenen and Andermatt at an alt. of 4,593 ft. The new bridge, built of granite, in 1830, has a single arch, 100 ft. above the stream. The old bridge, 20 ft. below, destroyed by the torrent in 1888, was the scene of the defeat



Devil's Bridge in the St. Gotthard Pass where the road crosses the torrent of the Reuss

of the French by the Austrians and Russians in 1799. A monument commemorates the event.

**Devil's Causeway.** Folk-name for a Roman road in Northumberland, England. Stone-paved, 22 ft. broad, it ran from Bewclay, on the road misnamed Watling Street,  $1\frac{1}{2}$  m. N. of Hadrian's Wall, for 50 m. or 60 m. through Hartburn, Long Framlington, and Lowick to Berwick. A road from High Rochester, the ancient *Bremenium*, joined the Causeway at Thruxton.

**Devil's Coach Horse** (*Staphylinus olens*). Popular name for a rove beetle of the family Staphylinidae, common about paths and gardens in most of Great Britain. It is about an inch long, dull black, with short wing-cases. When alarmed it curves its abdomen over its back in a threatening manner, usually emitting a fetid odour from glands at its hind end. Beetle and larva prey upon insects.



Devil's Coach Horse, popular name for the cocktail beetle

**Devil's Disciple, THE.** Burlesque melodrama by Bernard Shaw. The scene is laid in New England during the American War of Independence, and the play traces the exploits of Dick Dudgeon, a dare-devil young unbeliever who is moved to noble action in spite of his professions. First produced at the Kennington Theatre, Sept. 26, 1899, it has often been revived.

**Devil's Dyke.** Name of several prehistoric entrenchments and natural formations in Great Britain. The best known, 5 m. N.W. of Brighton, Sussex, is an early British hill-fort whose name has been transferred by recent usage to a naturalcombe close by. An area

of 190 acres was purchased by the town of Brighton, 1928. One in Cambridgeshire, 7 m. long, from Reach to Wood Ditton (Dyke-town), also called Devil's Ditch, crosses Newmarket racecourse and the Icknield Way. There are three in Norfolk, and one near Andover, Hants. The Deil's Dyke, 50 m. long, from Loch Ryan, Wigtownshire, to Solway Firth, was a rampart against the Galloway Picts. See Grim's Dyke.

**Devil's Island** (Fr. *Île du Diable*). One of three isls. called *Îles de Salut* (isles of health), belonging to the French department of Guiana, South America, and lying 27 m. N.W. of Cayenne. It was a notorious settlement for French convicts, Alfred Dreyfus having been among the celebrated prisoners there. Transportation to Devil's Island ceased in 1946.

**Devil's Parliament.** Name sometimes given to the parliament of 1459. Assembled at Coventry by Henry VI, its chief work was the attainting of the duke of York and his chief followers.

**Devil's Punch Bowl.** Popular name of Highcomb Bottom, a wooded glen near Hindhead, Surrey, England. It is described in Baring-

Gould's novel, *The Broom Squire*. A stone at the summit commemorates the murder of a sailor in 1786. The name is also given to a dark lough near the summit of Mangerton, co. Kerry, Eire.

**Devil's Sonata.** Name given to a sonata for violin written by Giuseppe Tartini (1692-1770). He declared that he wrote

this sonata after waking from a dream in which the devil had played it to him. It is also known as *Il Trillo del Diavolo*, *The Devil's Trill*.

**Devis, ARTHUR WILLIAM** (1763-1822). British painter. Born in London, Aug. 10, 1763, he studied at the R.A. schools. Appointed draughtsman to the East India Company, he travelled extensively in China and India. On his return to England, 1795, he painted a number of historical pictures, many of them popular through engravings. His *Death of Nelson*, in the Painted Hall at Greenwich, was executed from studies made on board the *Victory* after Trafalgar. Devis died Feb. 11, 1822.

**Devise** (late Lat. *divisio*, division). Term used in English law for a gift of land by will. See *Inheritance*; *Will*.

**Devitrification** (Lat. *de*, from, away; *vitrum*, glass). Change which takes place when glass is improperly cooled after manufac-

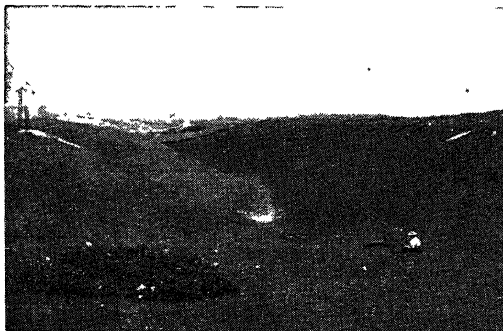


Devil's Punch Bowl. View from Gibbet Hill of the top of the Devil's Punch Bowl, where it is skirted by the Portsmouth road

ture. The glass becomes white like porcelain owing to the formation of crystalline matter in place of amorphous glass. Devitrified glass can be restored to the transparent condition by reheating and normal cooling. In geology, devitrification is a change in the structure of glassy volcanic rocks which has resulted from the development of minute granules, filaments, crystallites, and other rudimentary crystalline forms. It is accom-

panied by an increase of density of the rock, as is well seen in such types as obsidian and tachylite. See *Rock*.

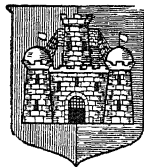
**Devizes.** Mun. bor. and market town of Wiltshire. It stands on the Kennet and Avon canal, 86 m. W. of London by railway. It is an agricultural centre,



Devil's Dyke. Natural amphitheatre, amid the Downs, five miles N.W. of Brighton, Sussex



having an important corn market. Agricultural implements are made; bacon, brewing, snuff, and tobacco



Devizes arms

provide other industries. For about four centuries before 1750 it was a centre of cloth manufacture. The chief building is the church of S. John, a beautiful cruciform building, with fine Norman chancel-arch and a massive tower. There are a market cross, presented by Henry Addington (Viscount Sidmouth) when M.P., some old wooden houses, and the museum of the Wiltshire archaeological society, which contains prehistoric objects from barrows in the county.

Devizes is supposed to mean on the borders (Lat. *ad divisas*), and it originated when Osmund, bishop of Salisbury, built a castle here about 1082. Bishop Roger in 1132 replaced it by a stone one which Leland says was the strongest castle in Europe. This was destroyed by Cromwell. Devizes became a chartered town in the 12th century, and from 1295 to 1867 sent two members to parliament. It is governed by a mayor and council, and gives its name to a co. division returning one M.P. Market day, Thurs. Pop. 6,381.

**Devlin, JOSEPH** (1872-1934). Irish politician. He was born in Belfast, where he was educated. He was Nationalist M.P. for Kilkenny, 1902-06, and for W. Belfast, 1906-22. As general secretary of the United Irish League and president of the Ancient Order of Hibernians, he was a force among Irish Nationalists. He sat in the parliament of N. Ireland for co. Antrim, W. Belfast, 1929, and Central Belfast, 1933. He died Jan. 18, 1934.

**Devolution** (Lat. *devolvere*, to roll down). Act of handing over something to another person. In politics it is used for a particular kind of home rule, federal devolution, as it is called. In 1904 a scheme of devolution for Ireland was discussed without result.

The word was much to the fore in British politics immediately after the First Great War, when a demand was put forward for federal devolution, i.e. separate legislatures for England, Scotland, and Wales. Two schemes were discussed at a parliamentary conference, 1919, but no action taken.

The word is also used for the descent of kingdoms or property

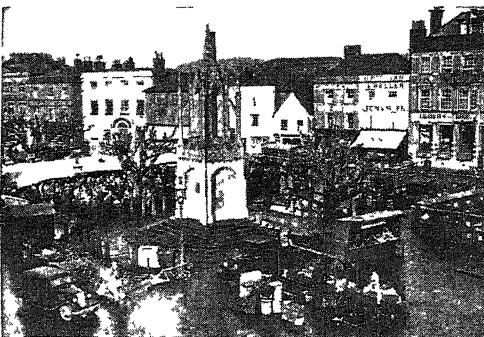
which devolve by law upon some person. The war between France and the Dutch republic in 1667-68 is known as the War of Devolution, because it arose out of a dispute as to how certain lands devolved.

**Devon** or DEVONSHIRE. South-western maritime co. of England. It lies between the Bristol and the English Channels, its area being 2,611½ sq. m. It is third only to Yorkshire and Lincolnshire in size among the counties of England. It contains an extensive moorland in Dartmoor, and also fertile regions with a climate

ure, such as Seaton, Sidmouth, Exmouth, Teignmouth, Torquay, Paignton, in the S., and Lynmouth, Ilfracombe, Westward Ho!, Clovelly, in the N. From Hartland Point fine coastal views are obtained. The county includes Lundy Island.

The chief rivers of Devon are the Tamar, on the Cornish boundary, the Exe, Teign, Dart, and Tavy, all flowing through lovely valleys, and the Taw and Torridge, falling into the Bristol Channel. Most of them rise on Dartmoor, whereon are the highest points in the county (High Will-

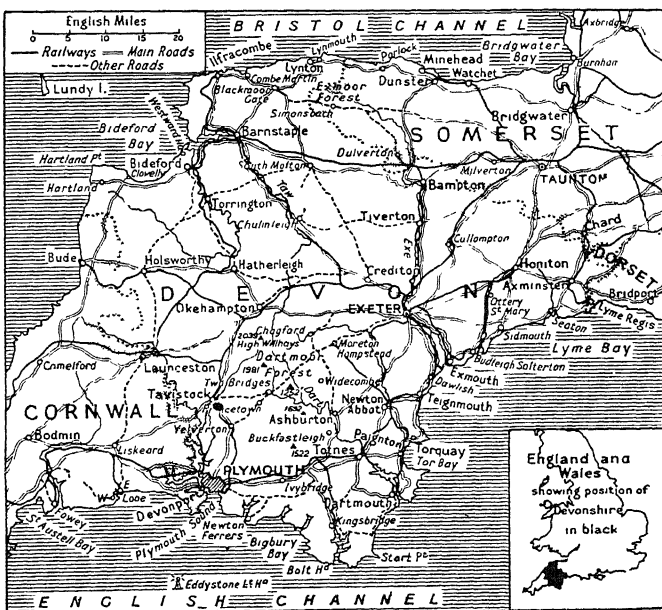
hays, 2,039 ft.). Red earth is characteristic of the S. part of the co. The county is mainly pastoral, but minerals are found, including tin, copper, iron, granite, and china clay. A number of the inhabitants are fishermen, engaged especially in catching pilchards, herrings, and mackerel. The county cider, cream, and



Devizes. Market place in this busy agricultural centre of Wiltshire

remarkably mild and a vegetation unusually rich. Most of the county is hilly and the coast-line is irregular. It is dotted with places visited for health and pleas-

cattle are celebrated. Chief towns are Exeter, the co. town; Plymouth, which includes Devonport, the largest; Torquay, Barnstaple, Tiverton, and Bideford. At Credi-



Devon. Map of the West of England county whose cider, cream, and cattle are known the world over

ton was born in 680 S. Boniface, apostle of Germany. The pleasant market town of Okehampton lies under the N.W. edge of Dartmoor. Devon, which is served by two rlys., sends six members to parliament, in addition to one for Exeter, one for Torquay, and two for Plymouth, and is in the diocese of Exeter. Pop. 732,968.

Before the Norman conquest Devon was part of Wessex, and its inhabitants then were a mixture of Saxons and Celts. Norman lords built castles in the county and its S. coast was frequently attacked by the French. Devon men soon won a reputation for seamanship, but the great time in the county's history came with the discovery of the American continent and the commercial rivalry with Spain. Many of the great English adventurers—Raleigh, Gilbert, Hawkins, Drake—were Devon men.

**LITERARY ASSOCIATIONS.** William Browne of Tavistock (d. c. 1643) wrote his *Lidford Journey*. Herick was rector at Dean Prior 1629-47 and 1662-74. Charles Kingsley, born at Holne, set many scenes of *Westward Ho!* in and about Bideford, and Blackmore's *Lorna Doone* country of Exmoor passes into Devon at Tiverton. The Wessex of Hardy's novels extends from Dorset into Devon. S. Baring-Gould wrote about the county in many of his stories, Eden Phillpotts made Dartmoor the scene of a series of novels, and John Trevena used the same background. The *Victoria History* of the co. appeared in 1906. See *Dartmoor*.

**Devon.** River of Scotland. It rises in the Ochil Hills and traverses parts of four counties—Perth, Kinross, Clackmannan, and Stirling—before entering the Forth at Cambus. There is a fine waterfall in the vicinity of the village of Crook of Devon.

**Devon, or North Devon.** An island of the N. American archipelago. Part of the N.W. Territories of Canada, it is N. of Baffin Island, S. of Ellesmere Island, and E. of Bathurst and Cornwallis Islands. Its N.W. extremity is called Grinnel Land. There is a harbour at Dundas, but permanent ice occurs in places.

**Devonian.** Rock system of the Palaeozoic era, intermediate between the Silurian and Carboniferous systems. In S.W. England the beds were deposited under marine conditions, but in Wales, central England, Scotland, and Ireland they were laid down in a series of large lakes. The marine

Devonian of Devon and Cornwall consists of mudstones, shales, slates at Delabole, grits, and sandstones, with limestones (Devonshire marble) in the Torquay and Plymouth areas. With these are associated pillow lavas and tuffs. The deposits are of shallow-water types to the N. and deeper sea types to the S.

The lake deposits of Devonian age are referred to as the Old Red Sandstone (O.R.S.) facies. Many beds represent areas of torrential deposition; they are coarse conglomerates and sedimentary breccias. A reddish brown colour due to iron oxide staining is characteristic. The O.R.S. is famous for its fossil fish remains. Land plants also made their first important appearance. In N. England and in Scotland there was much volcanic activity. In the Cheviots lavas and ashes followed by the intrusion of a granite and dykes are to be found. In the midland valley of Scotland volcanic rocks of various types pierced by ancient (now denuded) vents occur. The Lorne district of Argyll contains



Devonport. Royal Naval Barracks, which accommodate over 2,000 officers and men  
Valentine

lava flows, tuffs, and agglomerates. Masses of granite were emplaced about the same time at Glencoe, Ben Cruachan, Rannoch Moor, Ben Nevis, Peterhead, Aberdeen, etc. In the southern uplands are the granites of Loch Doon, Dalbeattie, etc. In the Lake District the Shap, Skiddaw, and Eskdale granites are of this period. Many intrusions of more basic rock (gabbro, etc.) also occur.

Deposits of marine Devonian are better developed in Belgium and Germany than in England. They continue E. into Russia, where they are locally (near Tikhvin) poorly consolidated blue clays, the upper surface of which has been converted to bauxite. Deposits of O.R.S. type are also present. In E. Greenland, O.R.S. beds are important. Marine and deltaic deposits of this age occur in eastern U.S.A., where remains

of tree-fern forests have been found in the sandstones. Elsewhere in America the Devonian strata are mainly marine; in places they contain oil.

**Gilbert Wilson, M.Sc., Ph.D.**

**Devonport.** Former co., mun., and parl. bor. of Devon, England, now a part of Plymouth (*q.v.*). A fortified seaport and naval station on the Tamar estuary, 224 m. S.W. of London, on two railways, it was known as Plymouth Dock until 1824. It was one of the "three towns" (Stonehouse and Plymouth being the other two) amalgamated Nov. 9, 1914. R. F. Scott, the Arctic explorer, was a native. Devonport has its own M.P. Market days, Tues., Thurs., Sat. Pop. 84,690.

Devonport is the seat of naval and military governors; the official residence of the port admiral and lieutenant-governor are at Mount Wise. The government establishments which line the Hamoaze or Tamar estuary, 4 m. long, include barracks, naval and military hospital, naval barracks, dockyard, and gun wharf. The dockyard at Keyham, an extension first developed in 1844, was established in 1691. There are four docks, from 660 ft. to 745 ft. long and 95 ft. wide, and seven smaller ones, the accommodation for large ships being much superior to that at Portsmouth. The Royal Naval Engineering College is also at Keyham. Famous vessels built here in-

clude the *Royal Sovereign* (1786); the battleships *Ocean* (1898), *Bulwark* (1899), and *King Edward VII* (1903), and the battle cruisers *Indefatigable* (1909) and *Lion* (1910).

In the Second Great War, an aircraft carrier, a cruiser, six submarines, and two floating docks were built at Devonport dockyard, where also over 200 destroyers damaged in the battle of the Atlantic (*q.v.*) were repaired. The dockyard played a major part in the naval preparations for the invasion of the Continent in June, 1944. It suffered extensive damage from air raids, but the repair organization made it 90 p.c. efficient within two months of the last and heaviest attack.

**Devonport.** Suburb of Auckland, N. Island, New Zealand. It stands on the N. shore of Waitemata harbour, communicating by



ferry with Auckland, 2 m. distant, and is mainly a residential district. Callopie dock, now the property of the British Admiralty, is a naval arsenal. Pop. 9,900.

**Devonport, EAST AND WEST.** Town of Tasmania, on the N. coast. It stands at the mouth of the Mersey river, 80 m. N.W. of Launceston, and was formerly known as Formby and Torquay. It has a steamer service to Melbourne and rly. to Launceston and Hobart. Pop. 5,151.

**Devonport, HUDSON EWBANK KEARLEY, 1ST VISCOUNT (1856-1934).** A British politician. Born Sept. 1, 1856,

he was educated at Cranleigh. He entered business and became the head of the firm of Kearley and Tonge, provision merchants. During 1892-1910 he was Liberal



Viscount Devonport, British politician Russell

M.P. for Devonport. In 1905 he was made parliamentary secretary to the Board of Trade, resigning in 1909 to become first chairman of the new Port of London Authority, from which post he retired in 1925. He was created a baronet 1908, baron 1910, and viscount 1917. During the First Great War he was Food Controller 1916-17. He died Sept. 5, 1934, and was succeeded by his son, Gerald Chester Kearley (b. 1890).

**Devonshire.** Name of a British breed of cattle. In colour deep red, sometimes flecked with white, the Devon, though not among the largest, is one of the most beautiful and economical breeds. The actual origin of the breed is not known, but it is certain that it owes its perfection largely to the Quartlys of Molland, in N. Devon, who, from 1700 to about 1850, were constantly improving it.

Devon cattle are as profitable a beef-producing breed as any in England, their beef being of prime quality and the bone small. As dairy cattle they are noted for quality; their milk produces the world-famous clotted cream and the best butter. See Cattle illus.

**Devonshire, EARL AND DUKE OF.** English titles borne by the family of Cavendish, the earldom since 1618 and the dukedom since 1694. It must be distinguished from the older earldom of Devon borne by the family of Courtenay. From 1603 to 1606, Charles Blount, Lord Mountjoy, who suppressed

Tyrone's rebellion in Ireland, was earl of Devonshire.

William, Baron Cavendish, created an earl in 1618, was a son of Sir William Cavendish and the famous Elizabeth—Bess of Hardwick. William Cavendish, 4th earl, was made marquess of Hartington and 1st duke of Devonshire (v.i.) in 1694. His grandson, the 3rd duke, was lord-lieutenant of Ireland in 1737-44. The 4th duke, William Cavendish (1720-64), was made prime minister in 1756-57, because his nominal leadership enabled Pitt and Newcastle to work together. The 5th duke (1748-1811) married Georgiana Spencer, whose beauty has been immortalised by Gainsborough and Reynolds.

Succession in the direct line was broken in 1838 when the 6th duke died unmarried. He was succeeded by a cousin, William Cavendish, earl of Burlington, whose long life (1808-91) was largely devoted to furthering the application of science to industry. The 8th duke, separately noticed below, was his son, the Liberal statesman better known as Lord Hartington.

His nephew, Victor Christian Cavendish (1868-1938), was born May 31, 1868, and educated at Eton and Trinity College, Cambridge. Succeeding to the title in 1908, he was governor-general of Canada, 1916-21, and colonial secretary in 1922. A principal guarantor of the British Empire Exhibition, 1924, he had to bring his public career to an end through ill health. He died May 6, 1938.

His son, Edward William Spencer Cavendish (b. 1895), succeeded as 10th duke. Born May 6, 1895, he was educated at Eton and Trinity College, Cambridge. He was under-secretary for the Dominions 1936-40, for India and Burma 1940-42, and secretary for the Colonies 1943-45. In 1947 he became grand master of English freemasonry.

The ducal states in Derbyshire, with Chatsworth and Hardwick Hall, came from Bess of Hardwick. Lismore Castle and the Irish estates came through the marriage of the 4th duke with the heiress of Richard Boyle, earl of Burlington and Cork. The valuable estates in Furness, which include the ground on which Barrow stands, came with the earldom of Burlington. The duke owns much of Eastbourne, and Bolton Abbey, Yorks. An eldest son is known as the marquess of Hartington.

**Devonshire, WILLIAM CAVENDISH, 1ST DUKE OF (1640-1707).** British statesman. Born Jan. 25,

1640, he became a courtier at the Restoration, afterwards passing some time in travel. For a period

he was in the navy and saw active service against the Dutch. In 1661 he entered the house of commons, and from 1675 was hostile to the policy of Charles II, and a bitter opponent of the Roman Catholics and the court party. He succeeded to the earldom in 1684, and in 1687 was one of the seven Whig peers who invited William of Orange to England. By raising the standard of rebellion at Derby on William's landing, he substantially assisted the transfer of the crown, and henceforth under William and under Anne he was one of the leading men of the realm. In 1694 he was made a duke, and died Aug. 18, 1707. A man of varied parts, a scholar and a critic of poetry and the fine arts, Devonshire was responsible for the building of Chatsworth. In politics consistently Whig and the champion of Protestantism, he was remarkable for his impartiality. His personal courage was considerable and involved him in several duels.

**Devonshire, SPENCER COMPTON CAVENDISH, 8TH DUKE OF (1833-1908).** British statesman. Born on July 23, 1833, he was the eldest son of the 7th duke. Educated privately and at Trinity College, Cambridge, he entered the house of commons as Liberal M.P. for N. Lancashire in 1857, and, as the marquess of Hartington, sat there until 1891. From 1885 he represented the Rossendale division of Lancashire.

As a representative of the Whig aristocracy, Lord Hartington became a lord of the admiralty in 1863, was soon made under-secretary for war, and in 1866 entered the Cabinet as secretary. In 1868 he became postmaster-general, and in 1871 secretary for Ireland. In 1875, when Gladstone retired, he acted as leader of the Liberals in the house of commons, until Gladstone's return in 1880. His supe



William, 1st Duke of Devonshire after Riley



Spencer Compton Cavendish, 8th Duke of Devonshire Bassano

session, however, did not prevent him from serving under Gladstone, and from 1880 to 1885 as secretary for India, and then for war, he was one of the Liberal leader's chief lieutenants. He did not share the eagerness for reform of some of his colleagues, notably Chamberlain, but in 1886, when Gladstone turned to home rule, these two stood out as the chief dissentients from that policy. Under their guidance the Liberal Unionist party was formed, and the opposition of Hartington to home rule was not the least cause of its defeat.

In 1886 Hartington declined to become prime minister, Lord Salisbury offering to serve under him, but he gave steady support to the Conservative ministry of 1886-92. In 1895, having been duke of Devonshire since 1891, he took office as lord president of the council under Lord Salisbury, and that post he held until 1903. Then came another landmark in his career, his opposition to Chamberlain's scheme of tariff reform, and he resigned office. He died at Cannes, March 24, 1908. Without a vestige of enthusiasm, the duke yet had a sane belief in liberal principles and a high sense of public duty. His great position and his love of racing tended to make office irksome to him. Late in life he married the widow of the 7th duke of Manchester. Having no children he was succeeded by his nephew, Victor Cavendish. *Consult* Lives, H. Leach, 1904; B. Holland, 1911.

**Devonshire**, GEORGIANA CAVENDISH, DUCHESS OF (1757-1806). English beauty and society leader. The eldest daughter of the first Earl Spencer, she was born June 9, 1757, and married the 5th duke of Devonshire in 1774. Her accomplishments were as remarkable as her beauty. She received Dr. John-

son at Chatsworth, wrote verses, and was the friend of the prince of Wales, Fox, and Sheridan. At the Westminster election of 1784 she canvassed for Fox, and is said to have bartered kisses for promises of votes. She died March 30, 1806, and was buried in All Saints' Church, Derby. Her portrait was painted by Gainsborough, Reynolds, and Angelica Kauffmann. *Consult* The Face Without a Frown, I. Leveson-Gower, 1944.

**Devonshire Club**. A London social club, founded in 1875 as a resort for the Liberals. It is no longer primarily a political club. The house at 50, St. James's Street was formerly known as Crockford's. It was built in 1827 and has richly decorated rooms and some memorials of Crockford's.

**Devonshire House**. A former historic mansion in Piccadilly, London, between Stratton and



Devonshire House, Piccadilly, London, demolished in 1926

Berkeley Streets. The town residence of seven dukes of Devonshire, it was famous during Georgian and Regency times as a centre of fashion and Whig politics. The site was originally occupied by Hay Hill Farm. Berkeley House, built here in 1665 by Lord Berkeley of Stratton, was purchased by the first duke of Devonshire in 1697. Destroyed by fire in 1733, the mansion was rebuilt by William Kent. In 1919 it was sold to a firm of London contract-

ors for more than £1,000,000, the 9th duke reserving the antiquities, Adam mantelpieces, etc., The iron entrance gates, designed by Inigo Jones and formerly at Chiswick, were taken down and incorporated in the boundary railings of Green Park, opposite, in 1921. The mansion was demolished and a block of offices, flats, and shops built on the site

in 1926. During 1947-49 the lease of the site was held by the J. Arthur Rank (g.v.) organization.

**Devonshire Regiment**. English regiment, originally the 11th foot, raised by the duke of Beau-



Devonshire Regiment badge

fort in 1685 to counter the rebellion following the duke of Monmouth's landing in Dorset. The regiment fought in Marlborough's campaigns, suffered heavily at Almansa (1707), and gained distinction at Dettingen (1743) and Fontenoy (1745). It served throughout the Peninsular War; at Salamanca (1812) it came out of action with only four officers and 67 men. The regiment took part in the Boer War and won a V.C. at Wagon Hill, 1900. The Devonshires raised extra battalions in the First Great War and were represented at Neuve Chapelle, Loos, the Somme, the Aisne.

During the Second Great War, the Devonshire Regiment served in Malta, North Africa, and Italy. Units were converted to anti-tank regiments, R.A., and from June, 1944, fought through France, Belgium, the Netherlands, and Germany. One infantry bn. served throughout the Burma campaign; another became an airborne bn. of the 6th airborne div. The motto of the Devonshire Regiment is *Semper Fidelis* (always loyal); the depot is at Exeter.

**De Vries**, HUGO (1848-1935). Dutch botanist. Born at Haarlem, Feb. 16, 1848, he became a professor in the univ. of Amsterdam. He produced a theory of evolution by mutation which has proved fertile in results. He died May 21, 1935. *See* Mutation.

**Dew**. Condensation of atmospheric moisture on solid objects. On a still, clear night the temp. of the earth's surface is lowered by radiation. This causes a cooling of the air in contact with the earth, and if the temp. of the earth falls to, or below, the temp. at which the air is incapable of holding its water-vapour without precipitation, i.e. the dew-point, some of the invisible water-vapour is changed to liquid, drops of which form on cold, exposed surfaces, e.g. grass, stones, or the ground. The amount of dew deposited depends upon the amount of water-vapour in the air, for if the air is quite dry there can be no condensation from it. Part of the mois-

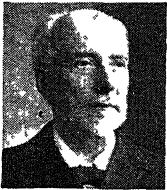


Georgiana, Duchess of Devonshire, with her child  
From a painting by Sir J. Reynolds

ture in dew formed on the ground comes either from the ground itself or from plants.

Dew-point is thus the temperature at which the atmosphere is said to be saturated. It can be obtained from readings of the dry and wet bulb thermometers by reference to tables. *See* Atmosphere; Hygrometer.

**Dewar, Sir James** (1842-1923). British physicist. Born at Kincardine-on-Forth, Sept. 20, 1842,



Sir James Dewar,  
British physicist  
*Lafayette*

he was educated at Edinburgh university, and here became assistant to Lord Playfair. He became Jacksonian professor of experimental philosophy at Cambridge in 1875, and Fullerton

professor at the Royal Institution two years later. His brilliant investigations into the liquefaction of gases, dating from 1874, and the properties of matter at extremely low temperatures, have proved of the greatest importance. He was the first to liquefy and afterwards solidify hydrogen and to show the great increase in electrical conductivity of metals at very low temperatures. By making use of charcoal as an absorbing agent he was able to separate hydrogen, neon, and helium from the air, and create the highest known vacuum. With Sir Frederick Abel, Dewar in 1889 discovered cordite. In 1902 he was president of the British Association. Knighted in 1904, he died March 27, 1923. His *Collected Papers*, ed. by his wife, appeared in 1927.

**Dewas.** Name of two former states of Central India, now forming part of Madhya Bharat (Malwa union). Although they had separate administrations, they shared the capital, Dewas. They had treaty engagements with the British govt. The states were founded by brothers in the third decade of the 18th century. The ruler of each was a raja. The area of the senior branch was 449 sq. m., and of the junior branch 419 sq. m. Pop. senior branch, 89,479; junior branch, 83,000; nearly all Hindus.

**Dewberry** (*Rubus caesius*). Name for a species of bramble. It is so called because the fruit has a dew-like bloom on it. *See* Bramble.

**D'Ewes, Sir Simonds** (1602-50). English antiquary. Belonging to a good Suffolk family, he was born Dec. 18, 1602. Educated at

Bury St. Edmunds and S. John's College, Cambridge, he became a barrister, but soon turned to his life work of delving into the records of the past. He transcribed a great deal, and his manuscripts, now in the British Museum, are historically valuable. His *Journals of all the Parliaments of Queen Elizabeth* was edited by his nephew in 1682. D'Ewes died April 18, 1650.

**De Wet, Christian Rudolf** (1854-1922). Boer soldier. Born in the Smithfield district, Orange Free State, Oct. 7, 1854, he became a farmer. Noticed for his services in the war of 1880-81, he was from 1885 to 1897 a member of the Volksraad of the Orange Free State. When war broke out with Great Britain in 1899 he was given a command and won early successes in Natal. In 1900 he became commander-in-chief of the O.F.S. army. His skill in the guerrilla warfare of 1900-02 made him much the most formidable

opponent of Britain in the field, and time and again he dashed suddenly upon a convoy and as suddenly disappeared, usually with the spoil. Elaborate plans for his capture were of no avail.

De Wet accepted the peace of 1902, and afterwards visited England, Europe, and America. From 1907 to 1914 he was a member of the legislative assembly and minister of agriculture. O.F.S. In 1914 he joined the rebellion; at Doornberg, on Nov. 7, he had a success, but four days later he lost heavily in men and material. His followers, including two sons, surrendered, but the old chief himself eluded his pursuers until captured at Waterburg on Dec. 1. His sentence was a fine of £2,000 and imprisonment for six years, but he was released at the end of a year. He died Feb. 3, 1922. *See* South African War.

**Dewey, John** (b. 1859). American psychologist and philosopher. Born at Burlington, Vermont, Oct. 20, 1859, he was educated at the state university. After holding professorships at the universities of Minnesota and Michigan, he went as professor of philosophy to Chicago, where he was also director of the school of education until 1904. Professor of philosophy at Columbia 1904-31, he then became

emeritus professor. Dewey was a representative of pragmatism, a conception of thought and knowledge in which most stress is laid on practical value. His chief works include: *Study of Ethics*, 1894; *Studies of Logical Theory*, 1903; *How We Think*, 1909; *The Quest for Certainty*, 1929; *Art and Experience*, 1934; *Logic*, 1938; *Freedom and Culture*, 1940.

**Dewey, Thomas Edmund** (b. 1902). American lawyer. Born at

Owosso, Mich., March 24, 1902. He was educated at Michigan and Columbia universities. Admitted to the New York bar, 1926, he was chief assistant attorney, southern district of New York, 1931-33, and special prosecutor of the investigation of organized crime, New York, 1935-37. District attorney of New York county, 1938-41, he became governor of New York in 1942. He stood unsuccessfully as Republican candidate for the U.S. presidency against F. D. Roosevelt in 1944, and against H. S. Truman in 1948 when his defeat was one of the great political surprises of the century.

**De Wint, Peter** (1784-1849). British painter. He was born of Dutch descent at Stone, Staffs, Jan. 21, 1784, and studied under John Raphael Smith, the engraver, and at the Academy schools. Confining himself mainly to water-colour, he first exhibited at the Academy in 1807; and in 1812 became a member of the Water Colour Society. His vigorous and luminous landscapes are painted wholly in "wash." He died June 30, 1849. *Consult* *Masters of English Landscape Painting*, ed. C. Holme, 1903; *Peter De Wint, M. Hardie*, 1929.

**Dewlap.** Loose fold of skin that hangs from the necks of cattle. It is, therefore, that which laps up the dew, although this derivation of the word is doubted. It is used for a like fold of skin in dogs and other animals.

**Dew-Pond.** Name applied to ponds, generally on chalk downs, which have no visible means of replenishment other than rain, and maintain their supply of water during hot weather, when ponds at lower levels have dried up. The name arose out of the idea that these ponds were replenished



Thomas E. Dewey,  
American lawyer



Christian De Wet,  
Boer soldier  
*Russell*

at night by dew, the supply being sufficient to maintain the balance between evaporation and precipitation. Extensive experiments on the South Downs have shown that although the grass around is wringing wet with dew, none of it passes into the pond close by. It has been stated that straw placed under the foundations of a pond will so tend to cool the water that dew will be deposited. This could take place only if the whole of the water fell in temperature below dew-point. The surface of the water would first cool, and then by convection would sink and give place to warmer water, and experiment showed that the short summer nights would not allow of the whole of a pond passing below the dew-point.

The rise in the level of such ponds corresponds with the existence of

**Dewsbury.** Mun. co., and parl. borough of the W. Riding of Yorkshire. It stands on the river Calder, 182 m. N.W. of London and 8 m. S.S.W. of Leeds, and is well served by railways. The Aire and Calder navigation gives water communication with Hull.



Dewsbury arms

is All Saints', an Early English building restored and rebuilt in the 18th century, and retaining some of its old glass. Other buildings are the town hall, technical school, etc. The chief industries are the making of blankets, shoddy cloth, and carpets, while around are coal mines. Dewsbury is governed by a mayor and council, and sends one member to parliament. Pop. est. 46,220.

**Dexter** (Lat., right). In heraldry, the right side of an heraldic shield. In describing a shield it is assumed to be carried by its owner, so the right side is to the left for the spectator. See Coat of Arms; Heraldry.

**Dextrin.** White or yellowish-white substance prepared from starch. It is soluble in water, and possesses adhesive properties similar to those of gum arabic. It is also known as British gum or starch gum. Dextrin is prepared by heating starch previously moistened with an acid, or by subjecting starch to the action of diastase. Payen's process for preparing commercial dextrin consists of moistening starch with weak nitric acid, making the mass into balls, drying, reducing to powder, and then subjecting to a temperature of 100°–125° C. in a hot-air oven. Dextrin is also prepared in the form of a syrup. The pure product is made by dissolving commercial dextrin in water, and precipitating the dextrin by means of alcohol. Dextrin is used in place of gum arabic by calico printers for thickening colours, as a dressing for crêpe, for stiffening surgical bandages, in making confectionery, and as an adhesive for postage stamps and envelope flaps. Photographers use it for mounting prints.

**Dextrose** OR GRAPE SUGAR. Substance found in nature as honey and in fruits and plant sap. It is called grape-sugar from its presence in ripe grapes, dextrose because it turns polarised light to the right (dextro-rotation), and sometimes glucose from its sweet taste. It may be made in splitting up starch by sulphuric acid. Water and acid are heated to boiling point and the starch-milk run in, the course of the conversion being followed by the iodine reaction which indicates the point at which the transformation of the starch into dextrose is complete. The liquid is neutralised with chalk and filtered; the filtrate is then made colourless by passing it through animal charcoal, after which it is evaporated in vacuum pans to the correct consistency. This process may be carried out under pressure, if desired.

In the U.S.A. hydrochloric acid is used to effect conversion, the starch, suspended in cold water, being pumped into large cylindrical vessels containing the heated acid. Commercial dextrose is a valuable sweetening agent in the manufacture of confectionery, preserved fruit and jams, wines, liqueurs, and is a substitute for malt in beer-making. Dextrose is widely used in medicine, being given either by mouth or by injection in some conditions of carbohydrate shortage. It is readily absorbed without further digestive action.

**Dey** (Turk. *dai*, Mother's brother). Turkish title. Originally a Turkish form of address for elderly men, it became the title of the commander of the janissaries. The ruler of Algeria was called dey, and those of Tunis and Tripoli deys or sometimes beys.

**Dhadi.** A former state of the Punjab, India, feudatory to the Jubbah state, now in Himachal union. Area 7 sq. m.; pop. 282.

**Dhak** (*Butea frondosa*). Tree of the family Leguminosae, a native of India, it has velvety trefoil leaves, and sprays of large orange-red flowers, which appear before the leaves. The natives wound the bark, from which flows a red astringent juice, which hardens by evaporation into a brittle ruby-coloured gum, variously known commercially as butea kino, gum butea, and Bengal kino. It is employed for tanning leather, which becomes dark in the process. An orange or bright yellow dye is also obtained from the flowers, but it is not permanent. Fibres from the



Dew-Pond. The pond near Chanctonbury Ring, on the South Downs, Sussex

night-fogs or early-morning mists. Precipitation is also greater on the higher ground at which the ponds occur, a factor which is amplified by the tendency of the wide shelving margins of the ponds to collect water. Analyses of pond-waters show that they contain a quantity of sodium chloride, brought in with mists from the sea. A pond can receive replenishment if a few stunted bushes are allowed to grow on its windward bank so that they drip into the pond. The only real dew-pond is one in which a few reeds or grasses grow, which, by projecting above the surface and by being good radiators, cause dew to be deposited upon them; and this trickles down into the pond. See Dew.

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bark serve as a substitute for oakum; and the seeds yield "moodooga oil," used as a native remedy for worms.

**Dhaleswari.** River in India, in Assam. Rising in the Lushei hills, it flows N. for 180 m. and joins the Barak at Siyaltek, in Cachar.

**Dhami.** Formerly a Simla Hill state, Punjab, India, now in the Himachel union. Its area is 28 sq. m.; pop. 5,114, nearly all Hindus.

**Dhamnoo** (*Grewia elastica*). Tree of the family Tiliaceae, a native of the Himalayas. Its strong and elastic wood is used by natives for making bows. It provides admirable shafts for horsed vehicles, and is used for many purposes where elasticity is required.

**Dhar.** Former state of Central India, now in Madhya Bharat. It took its name from the city of Dhar, which in the 9th century became the capital of Malwa under the Paramara rajputs and for centuries occupied a prominent position in India. The chief was a raja. The Lat (pillar) mosque, so called from an iron pillar supposed to date from the beginning of the 13th century, was built in 1405. Area, 1,800 sq. m.; pop. 253,210, two-thirds Hindus.

**Dharmasala.** Hill station of E. Punjab, India, and chief town of a district in Kangra. It lies on a spur of the Dhaola Dhar, at an alt. ranging from 4,500 ft. to over 7,000 ft., and has more rain than Simla. The station was destroyed by an earthquake in 1905.

**Dharwar.** District and town of India, in the S. of Bombay state. The district is noted for the excellence of its cotton, which is the chief article of export. Other products are millet, rice, wheat, pulse, oil-seeds, and sugar-cane. Dharwar fort is said to date from the beginning of the 15th century. The town has rly. communication with Goa. Area, 4,604 sq. m. Pop. dist., 1,201,016, five-sixths Hindu; town, 49,505, nearly three-quarters Hindu.

**Dhaulagiri.** Mt. peak of Nepal. In the Himalayan range, its height is 26,828 ft.

**Dhenkanal.** A former Indian state, now merged in Orissa. It has considerable iron deposits. Area 1,463 sq. m.; pop. 324,212, nearly all Hindus.

**Dhobi, DHOBY, or DHOBYMAN.** Indian caste of washermen. They number some two millions. Among the higher landowning castes they are remunerated by a fixed share of the produce of the soil. They are the only caste who use the donkey. In some provinces they

practise calico-printing and dyeing; some have become cultivators. The word dhobi is also used for the garments, etc., washed, and Mahomedans who are washermen are also called dhoymen.

**Dhobi Itch** (*Tinea cruris*). Skin affection so named because of the view commonly held in the East that clothes are infected by the washerman, the dhobi. The condition occurs as itching, sheet-like patches on the inner side of the thighs and on the perineum and scrotum, and is caused by the fungus *Epidermophyton*. It is almost confined to males, and, though a tropical affection, is now common in Europe. Treatment with an ointment consisting of 3 p.c. salicylic acid and 5 p.c. of benzoic acid in a simple base is usually effective.

**Dhole.** Name of a wild dog found in India, especially in the Himalayas. It looks somewhat like a chow. Of gregarious habits and great strength and courage, dholes frequently hunt tigers and other big game animals.

**Dholka.** Town of Bombay state, India, in the district of Ahmadabad, with which it is connected by rly. (39 m.). Reputed one of the oldest towns in Gujarat, it contains many ruins of palaces, mosques, and mausoleums. Dholka was ceded to the British in 1804. Pop. approx. 16,500.

**Dholpur.** Town and former state of India, since 1949 part of Greater Rajasthan. Its earliest treaty with the British government was made in 1779. The town, situated on the Great Indian Peninsular rly., is supposed to date from the 11th century. Area, 1,173 sq. m. Pop., state, 286,901, nearly all Hindu; town, 25,400, two-thirds Hindu.

**Dhow.** Long, fast-sailing Arab vessel, once much used for gun-running and slaving. It has only one mast with a very long yard-arm carrying a large triangular sail. There is usually a high poop. Dhows are most frequent in the Persian Gulf. See *illus.* under Boat, p. 1242.

**Dhrangadra.** Town and former state of India, now part of Saurashtra. Less than one-fifth of the total area is cultivated, the state consisting for the most part of rocky ground, from which a good building stone is quarried. Long-staple cotton is raised and by-products of salt are made. The capital is served by rly., which connects it with Wadhwan and Halrad. Area, 1,167 sq. m. Pop.

of state, 94,417, mostly Hindu, Jains, and animists; town, 16,000, two-thirds Hindu.

**Dhrol.** Former state of India, now part of Saurashtra. The cultivated area is small, the crops including cereals and sugar-cane. The chief was a Rajput, with the title Thakur Sahib. The town of Dhrol has a pop. of 8,500, two-thirds Hindu, the rest Mahomedans. Area of state, 283 sq. m.; pop. 33,617, mostly Hindu, Jains, and animists.

**Dhuleep Singh** (1838-93). Maharaja of Lahore. Son of Ranjit Singh, he was proclaimed Sept. 18, 1843, his mother acting as regent. Deposed on the annexation of the Punjab by the British in 1849, he was granted a pension of £40,000, and left India for England, adopted Christianity, and settled at Elvedon, Suffolk. In 1886, having lodged claims against the British government in regard to certain estates in India and the return of the Koh-i-noor diamond, which were rejected, he sailed for India, but was detained at Aden in connexion with a proclamation to the Sikhs. At Aden, he renounced Christianity, reverting to Sikhism. Pardoned by Queen Victoria in 1890, he made his home in Paris, where he died, Oct. 22, 1893.



Prince Dhuleep Singh

**Dhulia.** Town and district of Bombay, India, in Khandesh division. It is connected by a branch line with Chalisgaon on the Great Indian Peninsula rly., and is the centre of a cotton trade. Pop. 41,200, three-quarters Hindu.

**Dhurwai.** Former state of Central India, now part of the Vindhya union. Its area is 15 sq. m.; pop. 2,030, nearly all Hindu.

**Diabase** (Gr. *dia*, through; *basis*, going). Dark coloured, compact, crystalline rock. The term is used in America for dolerite (*q.v.*) and altered dolerites. It is still used in Europe for dolerites of pre-Tertiary age. In Great Britain the term has lost its age significance, but is applied to dolerites that have become altered or decomposed.

**Diabetes.** Disease which may take either of two forms in human beings. In *diabetes mellitus* the body chemistry of carbohydrate together with that of protein and fat is disturbed. It is characterised

by inability to utilise sugar owing to a failure of the secretion of the ductless "islands of Langerhans" in the substance of the pancreas. The sugar content of the blood thereupon rises, and sugar and acetone bodies deriving from ill metabolised fat are passed out in an increased volume of urine. The thirst of which the patient complains is due to the excretion of this sugar, as apparently it cannot be excreted without a good deal of water.

Diabetes is more common amongst Jews than Gentiles, and there is some factor of heredity. It is more often found in men than in women. The exciting cause of acute diabetes is not known, but it is common in those who are large eaters, overweight, or with high blood pressure. The onset of the disease may be acute or insidious. Loss of energy, fatigue, pruritus may be complained of. In severe cases thirst is troublesome, much fluid being drunk and much urine passed. Constipation is usually present. Boils and carbuncles are a frequent complication. Gangrene may occur in the elderly owing to the degeneration of the arteries associated with this condition. Many diabetics die of tuberculosis or bronchial pneumonia.

Fehling's solution and Benedict's solution are popular reagents in the routine examination of the urine of the diabetic for sugar. But to be of value they must be used accurately, and the amount of sugar present in the urine of a diabetic patient yields real information only when the complete picture of the case is considered.

The treatment of diabetes was revolutionised by the isolation in 1922, by Banting and Best, of insulin—the extract of the islands of Langerhans. This allows the blood sugar to be kept within normal limits, and the liver and muscle to obtain plenty of glycogen. It is destroyed in a digestive tract and so is given by injection. Its precise action is not yet understood, but it enables the diabetic to eat more widely and to lead a life approximating to normal.

If the blood sugar is lowered to too great a degree by too large a dose of insulin, such symptoms may develop as sweating, tremor of the hands, numbness of the face and tongue, and double vision, which may pass into unconsciousness. Mild symptoms are relieved by giving a little sugar, but if the patient is unable to swallow, glucose may have to be given intravenously. Conversely, diabetic

coma may be due to the absence of insulin in severe or untreated cases. In all cases of diabetes the aim of the physician is to correlate the amount of insulin given, exercise taken, sugar found in the blood and in the urine, and carbohydrate, fat, and protein eaten, as may be wisest for the individual patient.

*Diabetes insipidus* is an increase in the secretion of urine without the presence of any abnormal matter. It is due to interference with the internal secretion of the posterior part of the pituitary gland. The onset may be sudden, following emotional shock, or may develop slowly. It is characterised by intense thirst and the passing of large quantities of urine, which leads to broken sleep and broken health. The disease runs a long course, recovery being rare. Extracts of the pituitary gland are used in treatment without much success.

Hilary Ledgerwood, M.B.

**Diablerets** (Fr., little devils). Mountain mass of Switzerland. On the borders of Berne, Valais, and Vaud, it is at the W. extremity of Bernese Alps. Its height is 10,650 ft., and it was first ascended in 1850. There are several peaks, including the Oldenhorn, 10,250 ft., and glaciers, the chief being the Diableret and the Zanfleuron, 2½ m. long. See Bernese Oberland.

**Diabolo**. Game played with a double-coned top spun upon a string stretched between two sticks held one in each hand. The top is repeatedly thrown in the air and caught again on the string while spinning. Its ancestor was the Chinese Koney Grey, a species of double humming top. In 1712 Le Diable, as it was then termed, had a vogue in France. About 1906 the game was revived, mainly by a French engineer, Gustave Phillipart, who, with the help of C. B. Fry, invented a more scientific top or "devil." Throughout 1907–08 the game enjoyed a vogue in Great Britain, and there was a lesser revival in the 1930s.

**Diad.** Cytological term for two chromatids lying side by side. During meiosis, homologous chromosomes which are longitudinally split pair to form tetrads of chromatids. Each tetrad divides during the first meiotic division into two diads, each consisting of two chromatids. See Cytology.

**Diadochi**. Name given to the lieutenants and successors of Alexander the Great (q.v.).

**Diaghilev**, SERGE PAVLOVICH (1872–1929). Russian impresario. Born March 19, 1872, he went to

St. Petersburg (Leningrad) at an early age. Forming his own ballet company, he gave his first season in Paris 1908–09. At that time

western Europe was accustomed to conventional ballet as exemplified by the Petipa productions at the St. Petersburg Imperial school, but Diaghilev realized the art in different terms; it was ballet as an *ensemble* that became his obsession. Paris and London acclaimed Scheherazade, Spectre de la Rose, Firebird, and other revolutionary works. Pavlova, Nijinski, Karsavina, Lopokova, Massine, were among his dancers; his composers included Stravinsky, Tcherepnin, and de Falla, while among designers were Bakst, Picasso, and Derain. After the First Great War, ballets such as *Le Tricorne*, *Les Biches*, *Les Noces*, expressed the experimental, feverish movement of the period. When Diaghilev died, Aug. 19, 1929, Russian ballet as the world had known it died with him. See Ballet; Consult also Diaghilev: His Artistic and Private Life, A. Haskell, 1935; Serge Diaghilev, S. Lifar, 1945.



Serge Diaghilev, Russian impresario

Diagnosis (Gr. *dia*, between; *gnosis*, to know). Term used in medicine for the finding out, by correlating signs and symptoms, of the condition from which a patient is suffering. Symptoms are departures from the normal, complained of by the patient; signs are physical facts obvious to the doctor. X-ray examination and the resources of the pathologist's and physiologist's laboratories help to provide both the general and the detailed information on which accuracy of diagnosis depends.

**Diagoras** (fl. c. 464 B.C.). Greek athlete of Ialysus in the island of Rhodes. He gained many victories in boxing at the Olympian, Isthmian, Nemean, and Pythian games, and his prowess is celebrated by Pindar. Another Diagoras, a Greek philosopher of Melos, surnamed the Atheist, a pupil of Democritus, was exiled from Athens in 411 B.C. on a charge of impiety.

**Diagram** (Gr. *diagramma*, something marked out). Figure composed of lines, serving as an illustration. It can be used to represent symbolically the results of any action or process in physics, such as the rise or fall of potential, of heat, or of pressure, and in



general the variations which occur in functions. A working diagram is frequently supplied to indicate how different parts of a machine are to be made and assembled. A circuit or wiring diagram shows the connexions in electrical apparatus, e.g. a radio receiver, etc.

**Dialect** (Gr. *dialektos*, discourse). Term used with two different shades of meaning. It is sometimes applied to the collective language of one people as opposed to that of another people, but more commonly to a provincial or local section of a language, distinguished by certain peculiarities and spoken by a limited number of the whole population. Thus Greek may be called a dialect of the primitive Indo-European language, but as spoken by the Greek nation it is a language of which the dialects are Ionic, Doric, Aeolic, and others. The Romance languages are dialects of Latin; English, Danish, Dutch, German of the Teutonic group, but from another point of view are languages.

#### Dialect in England

In England the term dialect is generally applied to the local peculiarities of language and pronunciation found in different parts of the country; thus, we speak generally of north-country and more particularly of Cumberland, Yorkshire, Lancashire, and other dialects. A Londoner has some difficulty in understanding the language of a Cumberland dalesman, but when the peculiarities of a dialect are so numerous and pronounced that it is quite unintelligible to outsiders, it ceases to be a dialect and becomes a language. The main characteristics of a dialect in the restricted sense are the interchange of vowels and consonants, as in hame for home, zum for some, vour for four, the southern dialects in general exhibiting a preference for the softer sounds; grammatical differences, such as housen (houses), shippen (sheep), childer (children), thinken (plural); different words used in different parts for the same thing, as gar (to make), gey (very), brock (badger), cleg (horse-fly), fash (to trouble); voice-pitch; and accent.

Speaking generally, dialects are older than languages. In early times, as different tribes parted from the original stock and set out to find new homes, local surroundings and circumstances and the distribution of their members over an increasing area tended to produce a larger number of dialects. Migration, social upheavals, island and

mountain life, all contribute to the formation of dialects. But when one dialect has established a predominance over others, as being spoken by a more powerful or linguistically more vigorous section which impresses its individuality on other sections, it forms a centre of culture and is recognized as the literary standard and general means of communication amongst the educated. Thus, the Tuscan dialect, owing to the influence of Boccaccio, Dante, and Petrarch, has become the literary language of Italy. The remaining dialects are then relegated to a subordinate position and become *patois*, confined chiefly to the uneducated, and restricted to the expression of the requirements of everyday life. These dialects are valuable as preserving many relics of old words and grammatical forms no longer to be found in the written languages. Now and again they reassert themselves; thus, the Latin or Romance languages owe their origin not to the literary Latin of the Augustan age, but to the popular dialects of vulgar Latin. *See* Language.

**Dialectic** (Gr. *dialektikē*, the art of discussion). Introduced by Socrates and developed by Plato, it came to mean the art of methodical scientific inquiry, akin to, though differing from, logic. By the followers of Socrates it was degraded into sophistry. Aristotle distinguished dialectic proofs, leading to probable conclusions, from scientific proofs, leading to certain conclusions. *See* Logic; Sophists.

**Diallage** (Gr. *diallagē*, change). Variety of the mineral augite or diopside. It is grass-green, brown, or grey in colour, with metallic lustre and foliated appearance. It is a characteristic mineral of the gabbro family of rocks, with optical properties similar to those of augite (*q.v.*).

**Dialling**. In coal mining, making use of what is essentially a mariner's compass in planning the underground workings of a mine. *See* Mining.

**Dialogue** (Gr. *dialogos*). Conversation of a more or less formal character between two or more persons; generally applied to such conversation in dramatic or other fictional writing. In drama it is the means by which the story is developed and the individuality of the characters illustrated, more especially from the Elizabethan period, when the explanatory chorus ceased to be used. The use of dialogue for moral and didactic purposes dates back to Plato, most

of whose philosophical writings are cast in this form.

One of the earliest of literary forms, it developed in various ways; it plays a part in the Vision of Piers Plowman, and was utilised for conveying moral lessons and religious instruction in the old mystery plays and moralities, which were frequently nothing but moral teaching conveyed by means of dialogue between personified qualities. Dialogue plays an important part in aiding the novelist to impart reality to his characters.

**Dialysis** (Gr., separating). In chemistry, the separation of crystalloids from colloids. The chemist Thomas Graham (1805-69) found that if a mixture of colloids and crystalloids, in solution, is placed on one side of a bladder or a piece of parchment paper, and pure water on the other side, virtually the crystalloids alone pass through the semi-permeable membrane into the water. A repetition of the process will completely separate the colloids and the crystalloids. This process, called dialysis, is often used in medical examinations of poisoning cases. The more common deadly poisons are crystalloids, and can be readily separated from the large admixture of colloids with which they are usually associated in the intestines. *See* Osmosis.

**Diamantina**, DIAMANTINE, OR MÜLLER'S CREEK. River of Queensland and S. Australia. It is 350 m. long, flowing S.W. through Queensland into South Australia, debouching as the Warburton into Lake Eyre. In dry seasons it is a series of water holes.

**Diamantina** (formerly Tejuco). City of Brazil, in the state of Minas Gerais. It is 170 m. N. of Ouro Preto, and the terminus of a branch rly. to Curralinho. In a mountain valley, at an alt. of 3,700 ft., it is the centre of the diamond fields, and an industrial town, manufacturing cotton, cigars, and leather, and carrying on diamond cutting. Pop. 8,000.

**Diameter** (Gr. *dia*, through; *metron*, measure). In geometry, a straight line through the centre of a circle (or conic) joining two points on its boundary. The two points are diametrically opposite. *See* Geometry.

**Diamond**. One of the red suits in a pack of playing cards; or any card belonging to that suit. The suit has generally been associated with money or commerce; in early Spanish packs the diamonds appeared as gold pieces, in Germany as bells, in France as paving tiles; and fortune tellers regard a collec-

tion of the diamond suit as indicating worldly success. The ace of diamonds is sometimes nicknamed the earl of Cork. The nine of diamonds, which is Pope in the game Pope Joan, is known as the Curse of Scotland, but there is no agreement as to the origin of this name.

**Diamond.** A naturally occurring mineral composed essentially of carbon, crystallising in the isometric system. The finer stones are greatly prized as gemstones, and represent the greater part by value of diamonds sold. Most of the world's production by weight, however, is of off-colour and flawed stones (bort, ballas, carbonado) and is used in industry as an abrasive on account of its extreme hardness.

The discovery of the structure of diamond was one of the first successes of X-rays; it is composed of two similar face-centred cubic lattices superimposed so that any one point of one lies between four points of the other arranged at the corners of a tetrahedron. The crystals commonly show octahedral, hexoctahedral, and other forms; the faces are frequently rounded and striated. Twin-crystals are common and the crystals are often distorted. Diamond

is brittle and has a perfect cleavage and conchoidal fracture. It is the hardest known mineral; specific gravity, approx. 3.52. Crystals range in size from "dust" to giant pebbles such as the S. African Cullinan diamond (3,025 $\frac{1}{2}$  carats. The unit of measure of diamonds is the metric carat—142 carats equal 1 oz.).

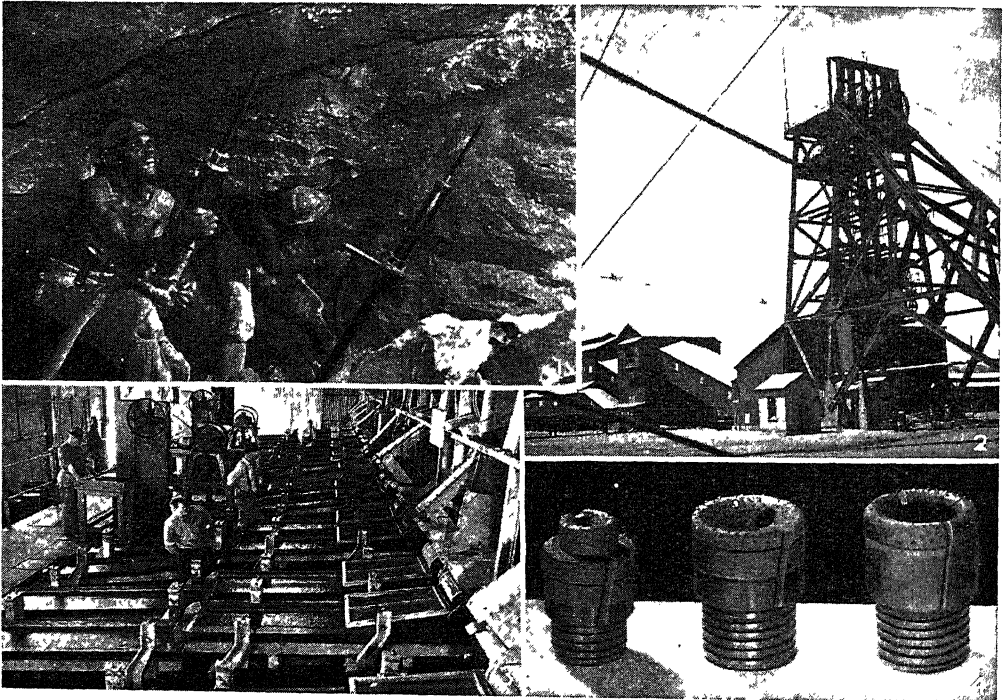
Pure diamond is colourless, but variations from this standard are common, and may be caused by impurities. Diamond burns readily at white heat in the presence of oxygen to form the gas carbon dioxide; the variety carbonado yields a slight ash. Diamond is resistant to acid and alkalis, but is destroyed when heated with sodium carbonate. It is the high refractive index and dispersion that make the fine-coloured and flawless stones sparkle attractively.

For gem purposes, purity of colour is desirable and the value of the stones varies accordingly. The perfect stone, of great rarity, is pure white and devoid of all flaws. In addition to diamonds of varying degrees of whiteness, coloured diamonds are found. Colour may be given in the order

of rarity thus: ruby red, rose pink, blue, emerald green (Brazil), bottle green (S. Africa). Brown in the delicate coffee-tinted Brazilians is esteemed, but otherwise is a drawback. A pale citron is also prized, but other shades of yellow, which may merge into the ochres, are not. Many stones are opaque or cloudy owing to minute fissures or air bubbles. Where a diamond by reason of discoloration is unsuitable for use as a gem, it can be used for one of many industrial purposes (*v.i.*).

Diamond occurs chiefly in alluvial deposits, commonly associated with minerals found in granitic rocks. In Brazil, the Ural Mts., and parts of the U.S.A., it occurs in quartzose conglomerates; it is also reported in pegmatite from India. S. African diamond occurs disseminated in cylindrical pipes of serpentine breccias ("blue ground") piercing carbonaceous shales—the original rock appears to have been a peculiar peridotite. These pipes are believed to represent volcanic rocks and the diamond is thought to be genetically connected with the eruptive flow.

The largest producer by weight



**Diamond.** 1. Mining operations: Native machine drillers at work in a chamber in the "blue ground" S. Africa. 2. Head frame of Dutoitspan Diamond Mine, Kimberley, showing the waste sorting and primary crushing plant. 3. Grease tables, that is, flat wooden tables covered with a quarter of an inch of pure grease. They are mechanically shaken as the diamond concentrate passes over them; the diamonds adhere to the grease, the remainder passes to waste. 4. Industrial diamonds: these diamond drilling crowns or bits are studded with industrial diamonds



is the Belgian Congo; a high proportion of its output, however, can be used for industrial purposes only. Other countries which yield diamonds are Angola and Sierra Leone, where a gemstone weighing 770 carats was found in 1945. The most valuable diamonds come from the Union of S. Africa (including S.W. Africa). The Gold Coast and Brazil come fifth and sixth. Alluvial discoveries have been made in China, the Malay Archipelago, Borneo, Australia, British Guiana, Arkansas, and French Equatorial Africa.

Owing to the irregularity of the shape of many stones and their "faults," they frequently suffer loss on being cut; the Cullinan diamond was cut into two large, seven smaller, and 96 tiny brilliants, the biggest weighing 516½ carats. Diamond-cutting is a difficult art, not only because of the hardness of the stones, but owing to the judgement needed in deciding upon the shape, so as to minimise faults and obtain the utmost play of fire by the arrangement of the facets. The art was perfected at Amsterdam and Antwerp, but is now also established in London, S. Africa, the U.S.A., and Palestine.

**INDUSTRIAL DIAMONDS.** Stones which have a poor colour or other impurity are classified as industrial diamonds. The better class are polished for inclusion in diamond tools. Those with cleavage or other faults that preclude their being cut and polished are known as crushing bort and are crushed to varying degrees of fineness to provide abrasives and diamond dust. This dust itself helps to cut and polish diamonds and other stones. In 1945, 80 p.c. by weight of the total world diamond production was used for industry. Diamond tools are used on grinding wheels made of such hard substances as corundum. Drilling bore-holes for sampling with a hollow cylinder crown studded with diamonds is common practice. Non-core drilling for blast holes utilises the industrial diamond (both types illustrated in Fig. 4, p. 2692). Other uses are the machining and turning of soft metals. Surface finishes of these metals achieve an average height of one micro-inch or less. Engraving on metals, glass, or plastics is carried out with a diamond engraver. Hardness testing of metals requires a diamond. Diamond dies, themselves drilled by a needle coated in diamond dust, are used for drawing wire. The diamond is the cutting agent in the ordinary glass cutter.

Attempts have been made to produce diamonds synthetically by the electric furnace and high pressure. Early experiments were conducted by Moissan and Hanay, and during the Second Great War intensive research was carried out by the German scientists Gunthe, Geselle, and Rebentisch, without success. Imitation diamonds, a kind of glass or "paste," are made for inclusion in the cheaper qualities of jewelry.

**HISTORIC DIAMONDS.** The most celebrated diamond is perhaps the Koh-i-Noor, which was presented to Queen Victoria by the East India Company and now forms part of the British regalia. The Orloff, said to have formed the eye of an Indian idol, was sold to Prince Orloff, from whom it passed to Catherine II of Russia. The Regent or Pitt diamond was found in India and purchased by Pitt, governor of Madras, for £20,400, and sold to the duke of Orleans in 1717. The Hope diamond is the largest and most perfect of the blue stones. The Star of the South, found in Brazil in 1853, was bought by the gaeikwar of Baroda for £80,000. From S. Africa have come the Excelsior (1893), the Jubilee (1895), and the Cullinan (1905). The Vargas, found in Minas Gerais, Brazil, in 1938, was sold to a Dutch firm for 700,000 guilders. See Crystallography; Gem.

**Diamond Hardness.** The hardness of metals, expressed in accordance with a special scale. The measurement is made by pressing the point of a diamond pyramid under a known load into the smooth, flat surface of the metal. The length of the diagonal of the square-shaped impression is measured under a microscope and hence the hardness compared to an international scale may be computed. Diamond is used because of its own exceptional hardness. See Brinell Hardness; Vickers Hardness.

**Diamond Jubilee.** Celebration of a sixtieth anniversary. The term is an extension of jubilee, which marks the fiftieth anniversary. The most famous diamond jubilee was that of Queen Victoria's accession to the throne of Great Britain, celebrated on June 22, 1897, when the queen drove in state from Buckingham Palace to St. Paul's Cathedral to return thanks to God. The accompanying procession was notable, as compared with that on the occasion of her jubilee ten years earlier, for its stress on Imperial unity.

**Diamond Necklace.** Valuable necklace which gave rise to an incident of some historical importance at the court of Louis XVI. Two Parisian goldsmiths collected a number of precious stones which they made into a necklace, one story being that this was intended as a gift from Louis XV to his mistress, Madame du Barry. However, it was not so used, and about 1784 they tried to sell it to Marie Antoinette, the queen of Louis XVI, but without success.

Countess de Lamotte persuaded Cardinal Louis de Rohan that she was all-powerful with Marie Antoinette. Her story of intimacy with royalty was known to be believed by many persons, among them the jewellers, who offered the necklace to the countess, hoping in this way to sell it to the queen. She told Rohan and he bought it, making the purchase in the name of the queen. The countess sent to him for it, and having secured it, sent her husband with it to London to sell the stones separately.

The jewellers soon required the cash for the promissory notes they had received from Rohan, and, not receiving this, told the queen of the matter. She denied either having ordered or having received the necklace, and in Aug., 1785, Rohan and the countess were arrested. Rohan was acquitted, although exiled from Paris, but the countess was severely punished. She escaped from prison, and in some Memoirs accused the queen of the plot. The part played by the queen in the affair remains a mystery. Consult Miscellanies, T. Carlyle; Historical Mysteries, A. Lang; The Diamond Necklace, F. Funck-Brentano, Eng. trans. H. Sutherland Edwards, 1911.

**Diamond Sculls.** Race for amateur single scullers rowed annually at Henley regatta. Instituted in 1844, its full title is the Diamond Challenge Sculls.

**Diamond Wedding.** Sixtieth anniversary of a wedding. The term is derived from the idea that diamonds were the most suitable gift for such an occasion. See also Golden Wedding.

**Diamorphine, DIACETYLMORPHINE, or HEROIN.** White, crystalline powder used in medicine as the hydrochloride. It is a drug of addiction and its use is subject to the provisions of the Dangerous Drugs Acts. It is prepared by the action of acetic anhydride upon anhydrous morphine.

**Diana.** In Roman mythology, an Italian deity identified with the Greek Artemis (q.v.).

**Diana, DUCHESS OF MONTMORENCY AND ANGOULÊME** (1538-1619). Natural daughter of Henry II. of France.



Diana, Duchess of Angoulême

From a contemp. print

She was born in Piedmont, her mother being Filippa Duca, and was educated in France. At the age of 15 she was married to a son of the duke of Parma, who was killed six months later. In 1557 she married Francis, son of the constable de Montmorency, and when widowed a second time, 1579, refused to marry again. Her counsels and influence helped to bring about the reconciliation of her half-brother, Henry III., with Henry of Navarre. She died Jan. 3, 1619.

**Diana OF POITIERS** (1499-1566). Duchess of Valentinois and mistress of Henry II. of France. Daughter of Jean of Poitiers, she was born Sept. 3, 1499, married at 15 to the grand seneschal of Normandy, and widowed at 32. About 1536 she became the mistress of the Dauphin, later Henry II. After his accession she was created duchess of Valentinois, and in effect became the ruler of his court, to the discomfiture of Catherine de' Medici, the queen. On Henry's death, 1559, Catherine compelled Diana to retire to her château at Anet, where she died.



dumle d'p'p'p'p'

After Primataccio

**Diana Monkey** (*Cercopithecus diana*). West African monkey, belonging to the guenon group. It has black fur, with a long white beard, throat and chest, and a white crescent above the eyebrows. The body is about 18 ins. long,



Diana Monkey, a native of West Africa

and the tail is about half as long again. This monkey, though gentle

and easy to tame, is not often to be seen in menageries owing to its delicate constitution.

**Diana of the Crossways.**

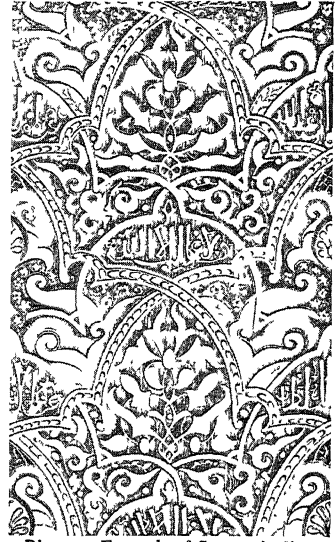
Novel by George Meredith. After appearing serially in *The Fortnightly Review*, it was published in volume form in 1885. The story increased the author's fame, partly owing to the belief that the heroine was modelled on Sheridan's granddaughter, the Hon. Caroline Norton. Similarities exist, and lent fresh colour to a baseless calumny that Mrs. Norton betrayed a political confidence to *The Times*. In the third edition, the novelist stated that *Diana of the Crossways* was to be read as fiction.

**Dianthus** (Gr. *Dios anthos*, flower of Zeus). Generic name of hundreds of species of such popular flowering plants as carnations, pinks, and sweet williams, of the natural order Caryophyllaceae. Natives of Britain and the whole of the E. Hemisphere, foreign varieties were introduced into England at various times between the period of Roman occupation and the 18th century. Originally certain species of the genus *Dianthus* were noted for their "clove" perfume, but hybridisation has eliminated this from many of the garden forms.

**Diapason** (Gr. *dia pasōn chor-dōn*, through all chords). (1) Musical term used with reference to pitch. Diapason normal was the standard pitch adopted in France in 1859. It signifies that middle A has 435 vibrations per sec. English pitch is slightly sharper, having 439 vibrations. The oboe always gives the A for orchestral tuning. (2) Diapason is also used for a series of organ foundation stops, 8 and 16 ft. Open diapasons have metal pipes open at the top; stopped diapasons, wooden pipes closed at the top. The latter are of 8 ft. tone, but of 4 ft. length, the stopping lowering the pitch an octave. The lengths mentioned represent the length of the deepest open pipe. Pron. diapayson.

**Diapente** (Gr. *dia pente*, through five). Medicine in old pharmacy containing five ingredients. It was last officially recognized in the *Edinburgh Pharmacopoeia*, 1744, and was composed of gentian, bayberries, aristolochia root, myrrh, and ivory dust, made into a confection with honey. Diapente, composed of gentian and various spices, is used in veterinary medicine as a tonic for horses.

**Diaper** (late Gr. *diaspros*, quite white). Term used in Gothic architecture for a small, conven-



Diaper. Example of Saracenic diapering from the Alhambra

tional pattern, geometrical or floral in design, used in decorating plain stone surfaces. It was seen on Gothic buildings, but it attained its greatest variety and beauty in Mahomedan ones. In textile fabrics the word is used for cotton or linen material woven with an all-over pattern of regular geometrical design. Heraldically, diapering is the decoration of a plain surface, or field, with an all-over background pattern, not sufficiently obtrusive to be mistaken for a charge.

**Diaphoretic** (Gr. *diaphorein*, to carry through). Drug which increases perspiration. Diaphoretics are used to stimulate the excretory functions of the skin and thus lessen the work thrown upon the kidneys.

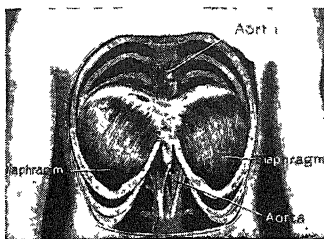
**Diaphragm.** In anatomy, a large, transverse, and dome-shaped muscle which divides the body into its two main cavities, the chest or thorax and the abdominal cavity. It is attached behind to the bodies of the 1st, 2nd, and 3rd lumbar vertebrae and to ligamentous arches which pass between the 1st lumbar vertebrae and the last rib. Laterally it is attached to the deep surfaces of the six lower costal cartilages, and in front it is attached to the ensiform cartilage which forms the lowest part of the sternum or breast-bone. The upper surface of the diaphragm is in apposition with the lungs and heart, the lower surface with the liver, stomach, and other visceral organs. The muscle is pierced by three openings, through which pass the oesophagus or gullet, the aorta, or main

blood-vessel of the body and the large vein known as the inferior vena cava. The diaphragm is the principal muscle of respiration, its contraction and descent enlarging the vertical measurement of the chest, and thus assisting in the process of inspiration, while its fibres are relaxed during the movement of expiration.

**Diaphragm** (Gr. *diaphragma*, partition). In physics, term used for the membrane through which liquids are diffused, as in dialysis. In electrolysis, it denotes the porous cell through which displacements of ions take place. In acoustics, it signifies a vibrating disk, which in a telephone also is called a diaphragm. In astronomy, it is the assemblage of lines, sometimes known as spider lines, used at the focus of a telescope to assist precision of determination when celestial objects pass into the telescope's field of vision. In photography, it means the relative size of the effective opening in the lens through which image-forming rays pass. Its area can usually be adjusted by a contracting ring (iris), by interposition of strips of metal carrying holes of various sizes (Waterhouse stops), or by rotating between the lens components a metal disk punched with a series of such holes.

**Diarbekir** OR **DIYARBEKIR**. Vilayet of Asiatic Turkey. It is a mountainous region, traversed by the Upper Tigris, but there is good soil in its valleys, producing grain, rice, and tobacco, and cattle are extensively raised. It contains copper mines which have never been properly developed. Pop. of Vilayet 257,321.

**Diarbekir** OR **DIYARBEKIR**. City of Turkey, capital of the above. The ancient Amida, it is called by the Turks Kara Amid or Black Amid, from the basaltic rocks in the neighbourhood. It stands on the right bank of the Tigris. It has been held in turn by Persians, Greeks, Romans, Arabs, and Turks: it was con-



**Diaphragm.** Diagram showing position of this muscle in the human body

quered by the Arabs of the Bekr, hence its more modern name, in 640, and taken by the Turks in 1515. Interesting remains include its citadel, on a hill 1,950 ft. high. Once a busy commercial centre, it still has an export trade in wool, mohair, sheep, goats, and ores. It is the seat of a Greek bishop and of the Catholic Patriarch of Antioch. There is rly. connexion with Samsun on the Black Sea. Pop. 41,260.

**Diarmid MacMurchada** OR **DERMOT MACMURROUGH** (d. 1171). King of Leinster. Having alienated the neighbouring chieftains by his crimes, he offered allegiance to Henry II of England in return for help in the recovery of his lands. Henry allowed him to recruit in England, and Strongbow, earl of Pembroke, came to his assistance, eventually marrying his daughter. On Diarmid's death Henry went to Ireland to claim the submission of the people, and thus began the English conquest of Ireland.

**Diarrhoea** (Gr. *diarrhōia*, flowing through). Passage of fluid or semi-fluid evacuations from the bowels. The pathological cause is increased activity of peristalsis or the rhythmic movements of the intestine. This causes the fluid contents of the small intestine to pass rapidly through the system instead of staying in the large intestine long enough for the fluid to be absorbed. The commonest exciting cause is the eating of indigestible or unsound food. Other causes are inflamma-

tion of the intestine; specific diseases such as typhoid, dysentery, and cholera; tuberculous or syphilitic ulceration of the intestine; irritant poisoning as by arsenic or powdered glass.

Diarrhoea due to indigestion is often best treated by a dose of castor oil to remove offending material from the bowel, followed by some bismuth preparation to soothe the bowel lining. But the diagnosis of simple indigestion should be beyond doubt, especially in children, in whom appendicitis has many varying manifestations. The specific diseases demand their specific treatment for the relief of the associated diarrhoea.

**Diary** (Lat. *diarium*, daily allowance or journal). Day by day record of transactions or occurrences. Primarily designed for the use or interest of the diarist, the diary has in a few instances come to be a valuable contribution to posterity's understanding of the period which it covers. Such are the diaries of Pepys and Evelyn, neither of which was published until more than a century after the diarist's death. To these two is due much intimate knowledge of the life of England during the latter part of the 17th century. Similar light on the life of the latter half of the 18th century, as lived by a country parson in Somerset and Norfolk, is provided by the diary of the Rev. James Woodforde, covering the years 1758-1802, and not published until 1924-31.

Wesley's journal throws light on aspects of life in the 18th century, while the diary of Mme. D'Arblay (Fanny Burney) covers the close of that and the earlier part of the 19th century. Notable literary diaries in the 19th century are those of Sir Walter Scott, Thomas Moore, and Henry Crabb Robinson; remarkable political and social journals are those of C. G. F. Greville and Thomas Creevey. The Notes from a Diary, by Sir M. E. Grant-Duff, published 1897-1905, also call for mention. The French diaries of Marie Bashkirtseff and the Goncourt brothers had considerable vogue towards the end of the 19th century. In the 20th century came "W. N. P. Barbellion's" Journal of a Disappointed Man, a diary of an unusual kind, published during the writer's lifetime; the revealing Journals of Arnold Bennett (3 vols.); and the many volumes of James Agate's Ego.

Diaries covering brief periods such as Diary of the Besieged Resident in Paris, by Henry



**Diarbekir, Turkey.** The ancient black basalt city walls which have protected Diarbekir since Roman times

Labouchere, 1871; that from which Lieut.-Colonel Charles à Court Repington quoted in his book, *The First World War*, 1920; or W. L. Shirer's *Berlin Diary*, 1941, are valuable for the light they throw on contemporary events. The Second Great War saw a spate of books in diary form describing writers' war experience.

In another sense a diary is a book which looks ahead instead of backward; in which a blank space is left for entries of forthcoming business and other engagements on each day of the year. See *Calendar*; *Memoirs*.

**Diary of a Nobody**, THE. Series of sketches, written by George Grossmith the elder and Weedon Grossmith and illustrated by the latter, first published in *Punch* in 1892 and in book form in 1894. A merciless satire on middle-class respectability, the diary is that of Charles Pooter, who lives at Highbury and works in the City; and presents his family, his neighbours Gowing and Cummings, and a host of minor characters like Padge (who says nothing but "That's right"), with side glances at the manners, conventions, art, etc., of the period.

**Dias De Novaes**, BARTOLOMEU (d. 1500). Portuguese navigator. His great feat was the discovery of the Cape of Good Hope. With two ships, he set sail in the summer of 1487, and after touching the Gold Coast in May, 1488, rounded the most southerly part of Africa. This he first named Cape of Storms, and later, in consultation with King John, Cape of Good Hope. His discovery opened the way for the voyages of Vasco da Gama. Dias was in command of a ship under Cabral, the discoverer of Brazil, when he was lost in a storm, May 29, 1500. Consult *Life*, A. Baldini, trans. W. J. Monson, 1935.

**Diaspora** (Gr. *diaspeirein*, to scatter). Term used for the dispersion of the Jews which took place some centuries before Christ. See *Jews*.

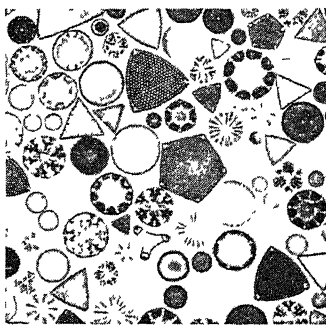
**Diaspore** (Gr. *diaspeirein*, to scatter). An orthorhombic mineral occurring in platy crystals; chemically, hydrogen aluminium oxide,  $\text{HAlO}_2$ . Diaspore is widely distributed and associated with corundum in emery rock, bauxite, atterite and aluminous clays, alkaline pegmatites, and xenoliths. The name alludes to the decrepitation of the mineral on heating.

**Diastrase** (Gr. *diastasis*, separation). Ferment contained in malt which has the property of convert-

ing starch into dextrin and sugar. It is contained in malt extract, and when this is added to starch paste a clear liquid results. A purer form is prepared by adding alcohol to a cold infusion of barley malt, the flocculent precipitate being separated and dried in a vacuum. The power of converting starch is destroyed entirely if diastase is heated to 75° C. for a short time. The dietetic value of malt extract depends partly upon its diastatic action, partly upon the nutritive carbohydrates it contains. It is also used in laundries for dissolving starch from linen collars and cuffs. See *Alcohol*; *Brewing*.

**Diatolē** (Gr., drawing apart). Phase of the heart-beat during which the heart muscle is in a state of relaxation, and the chambers of the heart dilate and fill with blood. In assessing blood-pressure the diastolic reading is the measure of the degree of rest which heart and vessels obtain. See *Blood*; *Systole*.

**Diatom** (*Diatomaceae*). Family of microscopic single-celled plants of the class *Conjugatae*, equally abundant in fresh and salt water. The cell-wall contains much silica, and consists of two transparent valves, each with a rim and one overlapping the other. Each diatom may be attached to another plant or some other body by a gelatinous stalk, or be unattached and free-swimming. As a rule, diatoms are



Diatom. Highly magnified specimens of these unicellular algae

propagated by division of one individual into two; but sometimes there is asexual conjugation. Over 10,000 species are known.

**Diatomite**, or **DIATOMACEOUS EARTH**. Chemically a hydrous form of silica. Deposits are compacted accumulations of minute siliceous shells of diatoms (*v.s.*). When algae die they sink to the bottom, where the organic parts decay and the siliceous parts accumulate to form beds of varying thicknesses. All the chief

economic deposits were formed during Tertiary times.

The largest today are in California; other producers are Denmark, Japan, Algeria, and U.S.S.R. When dry, diatomite resembles chalk in appearance, but is light, porous, absorbent, chemically inert, and has a low thermal conductivity. Its most extensive application in industry is for filtration of sugar, mineral oils, sewage, etc. It is also used as an insulator against heat, cold, and sound; a filler in paints, rubber, plastics, etc.; a carrier for nitroglycerine explosives; a mild abrasive, and in certain concretes.

**Diatonic** (Gr., through the tones). In music, the successive notes of any given scale, major or minor, no two notes of the same letter appearing, and the intervals between the various notes being always the same, whatever the keynote. Thus, starting on any note, the intervals in a major scale will always be tone, tone, semitone, tone, tone, tone, semitone.

**Diaz**, ARMANDO (1861-1928).

Italian soldier. Born at Naples, Dec. 5, 1861, he went to the military school, Turin, and entered the Italian army in 1881. He was on active service in Abyssinia in 1896. In 1916 he commanded the 23rd army corps in the Carso battles of the First Great War, and in 1917, following the defeat of Caporetto, he replaced General Cadorna as generalissimo and held up the Austro-Germans on the line of the Piave. In 1918 he defeated the Austrians along their whole front. Created Duca della Vittoria (duke of Victory), 1921, he died Feb. 29, 1928.

**Diaz**, BARTOLOMEU. Anglicised form of the name of the Portuguese navigator described in this work as Dias De Novaes, Bartolomeu.

**Diaz**, PORFIRIO (1830-1915). Mexican president. Born at Oaxaca, of Spanish parentage, Sept. 15, 1830, at first educated for the church. In 1849 he began to study law. In 1854 he joined the revolt against the dictator Santa Anna, and then fought under Benito Juarez as an anti-clerical in the civil war. Successes in the field brought him to the rank of general by 1861; he fought



Armando Diaz, Italian soldier  
Russell

against the French in 1862, and commanded the Mexican army against the emperor Maximilian.

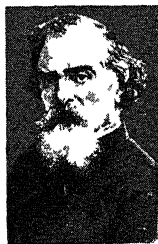


In 1867, after retaking Mexico City, he declined to serve under President Juárez.

On Lerdo's becoming president in 1872 Díaz led the opposition, entered Mexico City in triumph, 1876, was made provisional president, and elected president for four years in 1877. In 1884 he was re-elected, and so again for each term up to 1910, the constitution which had limited the president's tenure of office being amended. The long rule of Díaz brought order to Mexico. The country became comparatively pacified, foreign capital was invested, education advanced, trade increased. It was a sheer dictatorship, and at 80 Díaz was too old to enforce his commands, while his ruthless rule had made many enemies. In 1911 a revolution led by Madero drove him to resign. He left Mexico, to die in Paris, July 2, 1915, after having seen most of his work for his country brought to nothing. *Consult Life, C. Beals, 1933.*

*Benito Juárez*

**Díaz de la Peña, NARCISSE VIRGILE** (1808-76). French painter. Born at Bordeaux, of Spanish parentage, Aug. 20, 1808, he worked in the porcelain studios at Sèvres and studied art under Souchon. He became associated with the Barbizon group. He died at Mentone, Nov. 18, 1876. He is represented at the Louvre, in the Wallace Collection, London, and in many American galleries.



Díaz de la Peña,  
French painter

**Diazo-compounds** (Gr. *di*, twice; *azote*, nitrogen). In organic chemistry, bodies derived from aromatic hydrocarbons and containing two atoms of nitrogen in a characteristic grouping. They are prepared by adding nitrous acid to a cooled solution of a primary amine, or a solution of potassium or sodium nitrite to an acid solution. *See Chemistry.*

**Diazo-Dye-Printing.** System used in copying plans and drawings whereby a sheet of paper coated with a diazo-compound is exposed to powerful light in contact with the document to be reproduced and then developed by exposure to fumes of ammonia or by sponging. The result is a highly coloured positive image.

**Dibdin, CHARLES** (1745-1814). British song writer and entertainer. Born at Southampton, March 4,



*Charles Dibdin*  
After Drummond

1745, he was a choir boy at Winchester, and at 15 came to London. His pastoral operetta, *The Shepherd's Artifice*, produced in 1764, was the first of a long series of musical entertainments written by himself, in which he acted. In 1789 he started his "table entertainments," or *The Oddities*, for which he wrote *Tom Bowling* and other popular sea songs. His total output amounted to more than 70 dramatic sketches, over 600 songs, *A History of the Stage* (1800), novels, and an autobiography (1803). He died July 25, 1814, and is buried at Camden Town.

**Dibon.** City of the Amorites (Numb. 21). Situated on the E. side of the Dead Sea, on the Wadi Moabijb, it is represented by the modern village of Dhiban. It is best known from the discovery in it in 1868 of the Moabite Stone of King Mesha, about 900 B.C.

**Dibrugarh.** Town of Assam, India, in the Lakhimpur division. It is situated on the left bank of the Dibru river, just above its confluence with the Brahmaputra, and is the highest point reached by steamers from Calcutta. It is a centre of the tea industry and the headquarters of a district. Pop. 16,000, three-quarters Hindus.

**Dice** (plural of die). Small cubes made of ivory, bone, or hard wood, marked on each side with dots from one up to six, and so arranged that the one, or ace, is opposite the six, the deuce, or two,



Dice. Cubes used  
in the game

opposite the five, and the tray, or three, opposite the four. Among the earliest vehicles for gambling in use among the Greeks, dice spread afterwards over the whole world.



Dice. Beggar boys gambling with dice, from the painting by Murillo Old Pinakothek, Munich

Dice are said to have been invented, together with chess (*q.v.*), by Palamedes, son of Nauplius, king of Euboea, though Herodotus attributes both inventions to the Lydians. One to five dice may be employed, but two are most usual. A favourite mode of gambling with them is the simple throw of one player against another, at which large fortunes have been lost and won, especially in England under the Regency. The cubes are thrown from a dice-box on to the surface of a table. Some dice-boxes are carved inside with a succession of steps to minimise any attempt at trickery. Sharpers load the cube with lead so as to cause a high number to come uppermost.

Dice with different markings are used for the game of crown and anchor (*q.v.*); and for poker dice, in which the faces bear ace, king, queen, knave, ten, and nine, ranking as in playing cards.

**Diceto, RALPH DE** (d. 1210). English chronicler. A cleric, he was dean of St. Paul's in the time of Henry II. He was employed by that king on public business, but his fame rests on his writings. These include two chronicles; one, valueless historically, deals with the history of the world from the Creation. The other, *Imagines Historiarum*, deals with the history of England and is of high value for the time in which Ralph lived, i.e. the reigns of Henry II and Richard I.

**Dicey, ALBERT VENN** (1835-1922). British lawyer and writer. A younger brother of Edward Dicey, he was educated at Balliol College, Oxford. He was called to

the bar, but devoted himself to lecturing. During 1882-1909 he was Vinerian professor of English law at Oxford, and became a fellow of All Souls. Dicey's masterly *Law of the Constitution*, 1885, is an authoritative and indispensable work. He published *Lectures on the Relation between Law and Public Opinion in England during the 19th Century*, 1905. England's Case against Home Rule, 1886, is one of the best works on the controversy. Dicey died April 7, 1922. His *Memorials* were edited by R. S. Rait, 1925.

**Dicey, EDWARD** (1832-1911). British journalist. Born May 15, 1832, he was educated at Trinity College, Cambridge. He became a barrister, but took to journalism. Cool judgement and forceful style soon brought him reputation; he wrote for the *Daily Telegraph* and was editor of the *Observer*, 1870-89. His chief books are *England and Egypt*, 1881; *The Story of the Khedivate*, 1902; *The Egypt of the Future*, 1907. He died July 7, 1911.

**Dichloro-Diphenyl-Trichloroethane**, or D.D.T. Organic chemical compound made from chlorine, ethyl alcohol, and benzene. It is a white powder soluble in oil but insoluble in water. First formulated in Germany in 1874, D.D.T. is the active ingredient of a new kind of insecticides, but was not produced on any scale until 1937, when it was developed in the research laboratories of a British firm of dyestuff manufacturers. As a trial, the insecticide was used in Dec., 1943, by the British military authorities to combat a severe outbreak of typhus in Naples. Over 1,300,000 people were treated with the powder, and within three weeks the epidemic was completely under control. British troops invading the Continent in 1944 were provided with D.D.T.-impregnated shirts, which protected the wearers against lice for two months, even after regular washing.

The main uses of D.D.T. are against the lice which spread typhus and bubonic plague, and the mosquito which causes malaria; but it is also in wide domestic use. Treating wool with 0.1 p.c. of its weight of D.D.T. dissolved in oil makes cloth moth-proof, however many times it may be washed. Consult D.D.T.: The Synthetic Insecticide, T. F. West and G. A. Campbell, 1946.

**Dichroism.** Uniaxial minerals (tetragonal, hexagonal) may show two variations in quality or quan-

tity of colour when rotated in polarised light, and are said to exhibit dichroism. This phenomenon is due to the unequal absorption by the mineral of light vibrating in different planes. Dichroism can be observed under the petrological microscope when the polariser is in position. A dichroscope, important for the determination of certain gems, consists of a cleavage rhomb of Iceland spar (calcite) in a tube with an aperture at one end and a lens at the other. When a transparent crystal in front of the aperture is viewed through the lens, two images are seen side by side, each formed by rays vibrating at right angles. See Pleochroism.

**Dick, SIR WILLIAM REID** (b. 1879). Scottish sculptor. Born at Glasgow, Jan. 13, 1879, he was educated at the Glasgow school of art. From 1908 he exhibited regularly at the Royal Academy. His most famous works include the bronze eagle on the R.A.F. memorial, Thames Embankment, London; equestrian groups on



Sir Wm. Reid Dick,  
Scottish sculptor

Unilever House, London; the lion on the Menn Gate, Ypres; Livingstone statue, Victoria Falls, S. Africa; statues of George V at Westminster and Windsor. He designed the Roosevelt Memorial, London, and the Godiva statue, Coventry. He was R.A., 1928, pres. of the Royal Society of British Sculptors, 1933-38, and was knighted 1935.

**Dickebusch.** Village and lake of Belgium, in the prov. of W. Flanders. The former is 3 m. S.W. of Ypres, and was in British hands throughout the First Great War. It came into prominence in April, 1918, in the German drive for the Channel ports, but by May 11 a French advance north of Kemmel village had removed all danger of a break-through to Dickebusch. See Ypres, Battles of.

## DICKENS: THE GREAT NOVELIST OF MID-VICTORIAN ENGLAND

Coulson Kernahan

*An appreciation of the life and writings of a great novelist who retains his hold on the affections of the English-speaking world. See also the entries on his books and characters and the periodicals—All the Year Round, Household Words—with which his name is associated*

Charles Dickens was born at Mile End Terrace, Landport, Portsea, Feb. 7, 1812, and was baptized Charles John Huffham (or Huffam). His father was a clerk in the Navy Pay Office, his mother the sister of a fellow clerk. In 1814 the family moved to London, and in 1816 to Chatham. In that old waterside town, with its seafaring and longshore men, the highly imaginative boy spent seven "receptive" years. When he was eleven his parents left for London, where they were soon in difficulties. Charles became a household drudge, being sent even on pawning errands. Later, a small, sickly child, he was working in a blacking factory at 6s. a week, and, he tells us, "miserably unhappy."

To such straits did Dickens senior come that, his proffered composition being refused by the creditors, the family settled down in the Marshalsea prison, Charles being handed over to the care of an old lady in Camden Town. What such "care" meant may be realized when Dickens says: "I know that, but for the mercy of God, I might easily have been, for any care that was taken of me, a little robber or a little vagabond."

At twelve Dickens was sent to school in Camden Town. Thence he passed to a solicitor's office, but he had other ambitions than to follow law. For example, he was for a time drawn towards the stage as a career. By studying shorthand he qualified as a reporter, and in 1832 entered the gallery of the house of commons as representative of the True Sun, afterwards joining the staff of the *Mirror of Parliament* and the *Morning Chronicle*. In Dec., 1833, his first published sketch appeared in the *Monthly Magazine*. This was *A Dinner at Poplar Walk*, later included in *Sketches by Boz* as *Mr. Minns and His Cousin*. A year later he adopted the pseudonym of Boz.

The first of the *Sketches of London* were printed in the *Evening Chronicle*, 1835. In 1836 they were issued in volume form as *Sketches by Boz*, and Dickens abandoned reporting for literature. The first monthly number of *Pickwick* appeared on March 31, 1836, and two days later he married Catherine Hogarth, daughter of George Hogarth, manager of the *Morning Chronicle*. Dickens's struggling days were now ended, and happiness and brilliant success were his. His





1. The novelist's birthplace, Portsea, Portsmouth. 2. Portrait sketch by Samuel Laurence, 1837. 3. Giving a public reading, 1859. 4. Portrait by Frith, 1859. 5. House in Ordnance Terrace, Chatham, where Dickens lived as a small boy. 6. Dickens's wife. 7. Photograph, 1868. 8. His sister-in-law, Georgina

Hogarth, c 1850 (painting by A. Egg). 9. Gad's Hill Place, near Rochester, Dickens's home from 1857 to 1859. 10. His London home (1839-51), Devonshire Terrace, Marylebone. 11. The Chalet at Gad's Hill Place, in which he often worked. 12. No 48, Doughty Street, London, where he lived 1837-39, now a Dickens museum

**CHARLES DICKENS: SOME PORTRAITS AND HOMES OF THE GREAT ENGLISH NOVELIST**

domestic life was less fortunate. Incompatibility of temper as years went on made itself increasingly felt, until in 1838 husband and wife separated, after she had borne him ten children. For the rest of his life his sister-in-law Georgina Hogarth kept house for him.

Pickwick, by the time the first six numbers had appeared, was an unparalleled success, and in 1836 Dickens accepted the editorship of Bentley's Miscellany, the first number of which appeared in Jan., 1837. Oliver Twist ran serially in this publication until 1839, when Dickens resigned, having meanwhile been at work upon Nicholas Nickleby and occasional plays. The Old Curiosity Shop and Barnaby Rudge both appeared in Master Humphrey's Clock, which was a weekly serial designed as a regular vehicle for his work, but discontinued in 1841.

In 1842 Dickens visited America, publishing on his return his highly critical American Notes. The first part of Martin Chuzzlewit was issued early in 1843, and A Christmas Carol in Dec. In 1844 Dickens visited Italy, where he finished The Chimes. Amateur theatricals were always a joy to him, and in 1845, in distinguished amateur company, he played Bobadil in Every Man in his Humour at Miss Kelly's Theatre.

#### First Editor of Daily News


The Daily News was started in 1846 with Dickens as its first editor. He resigned within three weeks, after gathering round him an extraordinary array of talent. Dombey and Son was finished in 1848, and in 1849 the first monthly part of David Copperfield was published. His fame was now at its zenith, Dickens being the idol of the public, hailed as a warm-hearted champion of the poor and of right against wrong, and identified as a passionate, if not constructive, advocate of social reform. In 1850 he founded his own weekly journal Household Words. Bleak House followed in monthly parts, 1852-53. Hard Times ran as a Household Words serial, 1854; and the monthly parts of Little Dorrit appeared 1856-57. From 1857 he lived at Gad's Hill Place, near Rochester, Kent.

In 1858 he started a series of public readings. In 1859 Household Words was incorporated in a new journal, All the Year Round. This serialised A Tale of Two Cities, 1859. The Uncommercial Traveller, 1860 and Great Expectations, 1860-61. The Christmas numbers of both periodicals were famous. In 1861, 1862, and 1863

Dickens gave numerous public readings; and in 1864 the first part of Our Mutual Friend was issued.

A year later he was in a terrible railway accident at Staplehurst, Kent. Outwardly uninjured, he worked strenuously at the business of extricating the dead and dying. The shock to his nervous system—unrealized at first—proved eventually to be serious. He occupied himself in the five years between the accident and his death in giving readings in the U.K. and in America; and in 1869 began the book he was never to finish, Edwin Drood. But his health was failing. Resolutely determined never to give anything but his best to the public, Dickens—broken in nerve,

*Charles Dickens.*



and a martyr to insomnia—strained outworn strength beyond endurance, and collapsed.

He died at Gad's Hill Place at 6.30 a.m., June 9, 1870. He died as he had lived, the grateful and affectionate servant of the generation for which he had toiled so strenuously, and is buried in the Poets' Corner, Westminster Abbey.

Dickens stands essentially for everything that is English—some may be inclined to add "and middle class." His personality, his sentiment, his humour, are unmistakably English. He combined in himself the qualities, as well as some of the defects, of both sexes. He had not only the strength of English manhood, but not a little also of the wit, tenderness, and sentiment of English womanhood. His most pronounced literary vice, an occasional tearfulness—attributable to what Birrell calls "sentiment, that odious onion"—was due to what was womanlike in him.

G. K. Chesterton wrote that even the average Briton who has never read Dickens knows more about him through his characters than the same average Briton knows about the modern fiction writers whose works he has devoured. Even Chesterton's non-Dickens reading Briton thinks Dickens, talks Dickens, if unconsciously, and would find himself at a loss to apprehend much that he hears or reads were he without the secondhand knowledge of Dickens with which Chesterton credits him.

So real are the characters which Dickens created that to meet one

of them in the street might, for the moment, and until we were recalled to ourselves, occasion us no surprise. It would come almost as natural to say: "Here's Mr. Pickwick!" or "Isn't that Pecksniff?" as so to speak of actual acquaintances. Pickwick, Pecksniff, Micawber, and many another are more than characters out of books. They are integral parts not only of our literature, but also of our life and our language.

#### Unique Place as Novelist

As a novelist, Dickens cannot be classified, for he holds a place in fiction, and in his readers' affection, entirely his own. As a creator of character he stands unrivalled and alone. No other novelist has given us a portrait-gallery of like extent. As the generations come and go there will always be readers whose preference is for novels depicting the life and the day they know. But for the vividness, the variedness, the humour and the sympathy with which he pictures life and character, especially of the middle and poorer classes, of mid-Victorian times, the novels of Charles Dickens will endure while our language lasts.

The standard biography of Dickens was written by his intimate friend of over 30 years, John Forster, published 1872-74, and often reprinted and re-edited, notably by J. T. W. Ley in 1928. It is one of the classics of English biography, and a monument to friendship, and from its pages the admirers of the novelist first learned the details of his early hardships and struggles. But the work suffered from the defects of its virtues by omitting or glossing over many details of Dickens's personal life and character. Recent biographical researches have tended to concentrate on the facts behind Dickens's separation from his wife, and especially on the novelist's relations with the actress Ellen Ternan, to whom he left £1,000 in his will. It is now generally assumed, though by no means proven, that Ellen Ternan became his mistress. A selection of Dickens's letters, much over-edited by his sister-in-law and his daughter, appeared 1880-82. An infinitely more definitive and revealing collection, ed. W. Dexter, was published by the Nonesuch Press, 1938.

The life and work of Dickens have consistently attracted the pens of notable writers, among whom are Swinburne, Gissing, Chesterton, Quiller-Couch, R.



Straus, André Maurois, Stephen Leacock, Bernard Darwin, Hugh Kingsmill, George Santayana, George Orwell, J. B. Priestley. As the central figure of a novel *This Side Idolatry*, by E. Bechhofer Roberts, 1928, the novelist is treated with a deliberate lack of sympathy, though the work possibly had its uses as a corrective. More just re-estimates were offered in Dame Una Pope-Hennessy's *Charles Dickens, 1945*, and Hesketh Pearson's *Dickens, 1949*.

Meanwhile there is no evidence of any decline in Dickens's great popularity, except perhaps among the self-styled intelligentsia. At one period during the 1930s the competition of popular newspapers to increase their circulation led to the flooding of the market with complete sets of Dickens's works as free gifts. Yet during the Second Great War, when his works gradually went out of print and became unobtainable, it became clear that public demand was as great as ever and secondhand editions were greatly enhanced in value. The adaptation of some of the novels as broadcast plays in serial form, notably *Bleak House* in 1942, was a popular move on the part of the B.B.C.; and film adaptations, e.g. *David Copperfield*, 1935, *A Tale of Two Cities*, 1936, *Great Expectations*, 1946, Nicholas Nickleby, 1947, and *Oliver Twist*, 1948, offer further proof of Dickens's universal appeal.

**Dickens, Sir Henry Fielding** (1849-1933). British lawyer. The 6th son of Charles Dickens, he was born Jan. 16, 1849, and educated at Wimbledon and Trinity College, Cambridge. Called to the bar 1872, he took silk in 1892, and one of his most famous cases was the litigation between the insurance companies and the



Sir Henry Dickens,  
British lawyer

insured arising out of the earthquake in Jamaica in 1907. He became common serjeant of the City of London in 1917, was knighted in 1922, and retired in 1932. He died as the result of being knocked down by a motor-cycle in Chelsea, Dec. 16, 1933. His *Reminiscences* were published the following year.

**Dickens Fellowship.** Society founded in 1902 to perpetuate the memory of Charles Dickens and

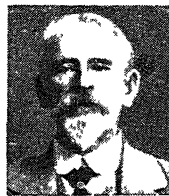
disseminate the spirit of his work. Branches throughout the English-speaking world hold meetings for lectures, readings, and social purposes. The *Dickensian*, a quarterly magazine founded by the fellowship as a monthly in 1905, is entirely devoted to the life and work of the author. The headquarters is Dickens House, 48, Doughty Street, London, W.C.1, purchased and equipped as a Dickens museum and opened to the public by the fellowship in 1925. Here *The Pickwick Papers* was finished and several of the earlier masterpieces were written.

**Dickinson, Emily** (1830-86). American poet. Born Dec. 10, 1830, she suffered an unfortunate love affair in 1853, and from that date began to develop as a poet in whose mystic experience few could fully share. She retired from public life, and died May 16, 1886. When a selection of her work appeared in 1892 she was acknowledged as one of America's greatest poets, though it was not until later that she became generally appreciated. Emily Dickinson's highly concentrated style has been likened to that of Emily Brontë. Her *Complete Works* was published in 1925 by her niece Martha Dickinson Bianchi, who published further poems in 1929 and had written a *Life* in 1924.

**Dickinson, Goldsworthy Lowes** (1862-1932). British philosopher. The son of a painter, he was born Aug. 6, 1862, and educated at Charterhouse and King's College, Cambridge, where he was a member of a brilliant group. Elected a fellow of his college, 1887, he was librarian, 1893-96, and then lecturer in history. He died Aug. 3, 1932. A lucid and penetrating thinker, Dickinson exploited the Socratic method of inquiry and revealed a sympathy with classical aesthetics. Some of his ideas anticipated the League of Nations. His works include *The Greek View of Life*, 1896; *Letters of John Chinaman*, 1901; *European Anarchy*, 1916; *The Magic Flute*, 1920. His *Life* was written by E. M. Forster, 1934.

**Dicksee, Sir Francis Bernard** (1853-1928). British painter. Born in London, Nov. 27, 1853,

he was educated at Henslow's school, first exhibited at the Academy in 1876, and became



Sir Frank Dicksee,  
British painter

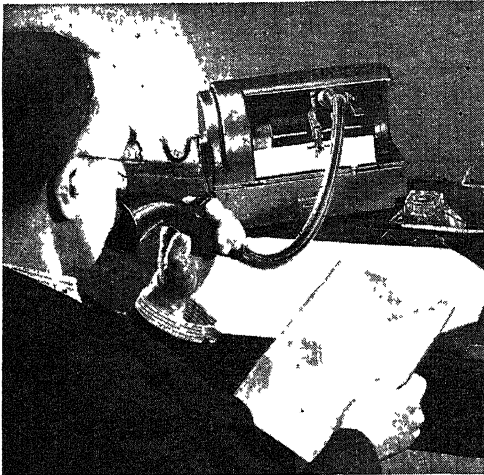
R.A. 1891. A painter of narrative and historical subjects, his work was greatly admired by a public which appreciated obvious poetic sentiments in a realistic form. His execution was smooth and competent, and his pictures bore such titles as *The Love Story*, *Too Late*, *Funeral of a Viking*, *Daughters of Eve*. Two were bought under the Chantry bequest for the Tate gallery: *Harmony*, 1877, and *The Two Crowns*, 1900. He became president of the R.A. in 1924, was knighted the next year, and died Oct. 17, 1928.

**Dicotyledons** (Gr. *di*, double; *cotyledon*, cup-shaped cavity). Class of flowering plants which, with the class *Monocotyledons*, constitute the *Angiosperms*. The cotyledons are the first seedling-leaves present even in the embryo plant within the seed, and may be flat and typically leaf-like in appearance, e.g. wheat, or swollen with food-reserves, e.g. bean. On germination, the seed food-reserves are used up, and the cotyledons may either remain below ground and wither, or rise above the soil and form the first green leaves of the young plant.

Dicotyledons always have two seed-leaves, monocotyledons only one; and there are other major differences between the two classes. Most dicotyledons have broad, net-veined leaves, stem vascular tissue arranged concentrically in a cylinder, and flower parts in fours or fives; whereas monocotyledons generally have sword-shaped, parallel-veined leaves, vascular tissue scattered in small bundles throughout the stem, and flower parts in threes or sixes.

**"Dictaphone."** Proprietary name for a machine which automatically records on a wax cylinder anything spoken into the mouthpiece of the flexible speaking tube. A finger grip on the speaking tube controls the movement of the cylinder, which runs during actual speaking only, and is stopped during pauses. The speaker, to hear what he has said, presses over a small lever, which "back spaces" the recorder carriage, and listens at the mouth-

piece. When the lever is brought forward again to the "dictate" position, the recorder is moved forward to clear the matter already given, and dictation is resumed. The cylinder can be removed to a transcribing machine and the speaker's words heard by a typist, etc. The Dictaphone electronic machine employs electrical recording through a microphone (which serves as a loud speaker when listening). Some models record telephone conversations, interviews, etc.



"Dictaphone": a recording machine. Words spoken into the flexible tube are recorded on the wax cylinder; this, when filled, is transferred to a transcribing machine  
*Courtesy of the Dictaphone Co., Ltd.*

**Dictator.** Magistrate in the Roman republic, appointed only in time of exceptional difficulty and danger. It lay with the senate to determine whether the necessity for a dictator existed, while it was usually one of the two consuls who designated the actual person to be invested with the extraordinary powers. The dictator was assisted in his duties by a lieutenant of his own choice called *magister equitum* (master of horse). In 202 B.C. the old dictatorship was abolished, and was not revived until the time of Sulla, who in 81 was appointed "dictator for drawing up laws and arranging the constitution." His office, however, differed entirely from the old dictatorship. Caesar also frequently assumed the title. In 44 Antony finally abolished the office. Notable dictatorships were those of Fabius Maximus Cunctator in the 2nd Punic war, Sulla, and Julius Caesar.

In modern times the word has been loosely applied to rulers who obtained brief leases of power, e.g. in the South American republics—Bernardo O'Higgins, dictator of Chile, 1817–23. While Adolf Hitler in Germany and Benito Mussolini in Italy each bore a title meaning in English leader, they were popularly referred to abroad as dictators; as were, by their opponents, Joseph Stalin of the U.S.S.R., and Francisco Franco of Spain.

**Dictē.** Ancient name of Lasithi, a mountain over 7,000 ft. high in east Crete. In Hesiod, the birthplace of Zeus is given as the Dictæan

Cave; in Lucian, Zeus led to this cave the maiden Europa. The cave was excavated by D. G. Hogarth in 1900, when proof was found that it was the place traditionally associated with the legend. Dictæus was a Latin adjective for Cretan.

**Dictionary** (Lat. *dictio*, saying, word). List of words, sometimes including proper names, arranged either in purely alphabetical or etymologically alphabetical order, in which words are classed under the same root. Each word is accompanied by an explanation of the meaning, its derivation, and pronunciation, quotations from literature illustrative of its uses being frequently added. The name is supposed to have been first used by John Garland (13th century). There are several terms in use to express works of a similar nature, but differing in certain particulars. The aim of a Thesaurus (storehouse) is to include all the words of a language. A Glossary contains a list of glosses (obscure or antiquated words). A Vocabulary is generally limited to the words, or one special work, of a particular author.

In England the name lexicon is usually reserved for a dictionary of foreign languages, especially Greek and Latin; the German *Konversations-Lexikon* (Brockhaus, Meyer) is rather an encyclopedia. An Idioticon (individual) deals with special forms and idioms; an Onomasticon with proper names.

The term dictionary may be extended to cover all branches of knowledge. There are dictionaries of biography, etymology (deriva-

tion of words), geography (gazetteer), history, law, philosophy, of synonyms and quotations, and rhyming dictionaries; concordances (complete lists of the words in a work, with references to every passage in the text where they occur). The most extensive range of subjects is covered by the encyclopedia, which deals with the whole circle of knowledge.

Earliest Greek and Latin word books were mainly collections of unusual words and phrases, often limited to one particular author. The nearest approach to a modern dictionary is the work of Valerius Flaccus (time of Augustus), *On the Meaning of Words*, of which an abridgement is extant. The lexicon of Suidas (11th century) is partly biographical, partly lexicographical, and specially valuable for its quotations from the works of authors now lost. In the 9th century Arabic and Jewish scholars compiled dictionaries of Arabic and Hebrew. The great Arabic *Kamus* (ocean) belongs to the 14th century. The revival of learning in the West, due to the Greek scholars who left Constantinople after its capture by the Turks, led to the desire for works dealing with linguistic difficulties, and the introduction of printing rendered possible the satisfaction of this desire. Of this nature are the polyglot dictionary of Calepino (1502) in seven languages; the Latin (1531) and Greek (1572) Thesaurus of Robert and Henry Stephanus (Estienne); the glossaries of Du Cange to medieval Latin (1678) and Greek (1688); Forcellini's Latin Lexicon (1771); the Italian *Vocabolario della Crusca* (1612); Dictionary of the French Academy (1694, 8th ed., 1st vol. (1878–1921).

The first real English dictionary was Samuel Johnson's (1755), in which the use of words was for the first time illustrated by quotations; it is still of value. The Oxford New English Dictionary, projected as early as 1857, was issued volume by volume 1884–1928, its principal editor being Sir James Murray (1837–1915). The Universal English Dictionary (ed. H. C. Wyld) first appeared in weekly parts 1931–32. Webster's New International Dictionary (American) appeared in 1911. Famous foreign works are the French series known as Larousse, and in the U.S.A. the Century Dictionary. Among popular small dictionaries are Nuttall's, Chambers's, and the Concise Oxford. See Concordance; Encyclopedia.

**Dicycle.** Machine differing from a bicycle in that the two wheels, between which the rider balanced himself, were parallel instead of being placed one in front of the other. Invented by E. C. F. Otto about 1879, it met with little success.

**Didachē** (Gr. teaching). Short title of an early Christian treatise called in full *The Teaching of the Twelve Apostles*. Various dates from A.D. 65 to A.D. 160 have been assigned to this work which was lost until Philotheos Bryennios, the Greek metropolitan of Nicomedia, discovered it in 1883. The first part consists of *The Two Ways* (of Life and of Death), and includes a collection of counsels on Christian virtues; the second provides a series of rules for baptism, fasting, and the Eucharist; and the third treats of the Christian ministry. The bulk of the *Didachē* was re-issued as the *Apostolic Constitutions* in the 3rd century. The origin of the work has been a matter of controversy. The first part may possibly be a revised edition of a Jewish book of instructions for proselytes; much of it is word for word identical with the Epistle of Barnabas. Several editions have been issued with English translations since 1883. *Pron.* Did-a-kee.

**Didcot.** Town of Berkshire, England. It is 5 m. S. of Abingdon and is a rly. junction for Oxford. The church is possibly 13th century. Near, at Harwell, is a station for atomic research. Pop. 1,660.

**Diddler, JEREMY.** Character in J. Kenney's farce, *Raising the Wind*, 1803. He is an artful swindler who obtains money and credit by imposing upon the credulous. The name has come to be used as a term for swindler.

**Didelphia** (Gr. *di*, two; *delphos*, womb). Sub-class of mammalian animals. It comprises those in which the female is usually furnished with a pouch for carrying the young, such as the kangaroos and opossums. The term is synonymous with marsupial (*q.v.*).

**Didelphyidae.** Family of pouched mammals, comprising the true or American opossums. With the exception of the yapok, a tropical web-footed water-opossum (*Chironectes*), they are of nocturnal habit, mostly arboreal, some of them with the pouch rudimentary or wanting, and constitute the genus *Didelphys*. Found chiefly in Central and S. America, the common or Virginian form ranges into the U.S.A. Fossil opossums called *Peratherium*, found in eocene N. America and Europe—

including Hampshire—disappeared in oligocene times. They were succeeded by the living didelphyids, which developed in pleistocene S. America.

**Diderot, DENIS** (1713–84). French scholar. Born at Langres, in Champagne, Oct. 5, 1713, and educated by the Jesuits, he declined to study law or medicine, and, early thrown on his own resources, turned to literature, working for many years as a bookseller's hack. In 1749



After Greuze

his *Lettre sur les Aveugles*, a philosophical treatise, displeased the authorities, and he was imprisoned for three months at Vincennes. For more than 20 years after this he was chiefly occupied, as joint editor with D'Alembert, with that immense undertaking, the *Encyclopédie*. In later years he was assisted by Catherine II of Russia, whom he visited in 1773.

After Voltaire and Rousseau, Diderot was the greatest intellectual force in the France of his age, but his interests were too wide to allow perfection in any one form of literature. His best known writings are *Le Paradoxe sur le Comédien*, a discussion of the actor's art in which he laid the foundations of the serious drama of ordinary life; his satire *Le Neveu de Rameau*; and two works of fiction, *La Religieuse* and *Jacques le Fataliste*. These were all published posthumously. But his name will always be most closely associated with the *Encyclopédie* (17 vols., 1751–65, and numerous supplements), which under his directorship became a formidable instrument of the most advanced thought of the time. He died July 30, 1784.

From a bibliographical point of view the student of Diderot is faced with huge difficulties. In France, the official hostility to his work made Diderot often reluctant to publish. Instead, he confided his MSS. to friends, who were not always worthy of the trust he reposed in them. As a result, much of his copy was grievously tampered with, and some of his books, notably *Jakob und sein Herr*, 1792, and *Rameaus Neffe*, 1805, appeared first in German translations. See *Encyclopédistes*; consult also *Diderot and the Encyclopaedists*, John Morley, repr. 1891.

**Didius Salvius Julianus, MARCUS.** Roman emperor from March 28 to June 1, A.D. 193. When the praetorian guards, after the murder of Pertinax, put the throne up for auction, Didius was the highest bidder, and thus secured it. On the approach of the rival claimant Septimius Severus, he was murdered by the soldiery.

**Dido or ELISSA.** Legendary founder of Carthage. She was the daughter of Mutgo or Belus, king of Tyre, and the wife of Sichaeus. Sichaeus was murdered for his wealth by Pygmalion, successor of Belus, but Dido secured possession of her dead husband's treasures and with a few followers set sail for Africa. There she purchased from the inhabitants some land on which she built a citadel, the nucleus of the city of Carthage. Iarbas, a neighbouring king, sought her in marriage, but Dido, wishing to remain true to the memory of her husband, stabbed herself. According to Virgil, Dido fell in love with Aeneas when he landed in Africa, and committed suicide after he had deserted her. See *Aeneas*.

**Didon, HENRI** (1840–1900). French preacher and writer. He was born at Touvet, March 17, 1840, and entered the Dominican order in 1858. Ten years later he became famous as a preacher in Paris. During 1880–87 he was engaged in writing a *Life of Christ* (Eng. trans. 1891). He died at Toulouse, March 13, 1900.

**Didot.** Name of a French family of printers and publishers. The founder, François (1689–1757), opened business in Paris in 1713 at the sign of the Bible d'Or. Of his successors, François Ambroise (1730–1804), his son, published the celebrated Dauphin edition of the classics and the 64-volume collection for the Comte d'Artois; Firmin (1764–1836), grandson, invented the word stereotype and utilised the process to issue inexpensive editions of standard works; Ambroise Firmin (1790–1876), great-grandson, translated Thucydides, 1833, wrote a monograph on Aldus Manutius, 1875, and with his brother Hyacinthe (1794–1880) published a number of encyclopedias and a new edition of H. Stephanus' (*Estienne's*) *Thesaurus of the Greek Language*, 1831–65.



Firmin Didot,  
French printer

**Didsbury.** District of Manchester, England. It consists of two eccles. districts, Christ Church and S. James's, in the S. of the city. It has a railway station, and is connected with the centre of Manchester by tram and bus. It is largely residential. There is a training college for the Methodist ministry. Pop. 23,581. *See* Manchester.

**Didymium.** Name given to a substance separated from the cerium group of metals by Mosander in 1841. Originally believed to be an element, it was in 1885 separated by Welsbach into two elements, praseodymium, atomic number 59, and neodymium, atomic number 60. The term is, therefore, dying out. *See* Neodymium; Praseodymium.

**Die.** Word used in various senses. In coining and engraving, it is an engraved plate block, or stamp for impressing a design or figure upon blanks, planchets, paper, or other material. In coining the dies are countersunk to produce impressions in relief on both sides of the blank.

In punching machines a die is a plate or block for supporting materials to be punched, with a hole cut in it of the same size as the punch, through which pass the pieces of punched metal.

In screw-cutting it is a block of metal provided with an internal screw thread formed with cutting edges and clearance spaces for cutting screw threads on bolts, rods, etc. A screw-cutting die may comprise one or more pieces held in a stock. In forging a die is a pair of metal blocks which impart a pre-determined shape to metal swaged between them. Die is also the singular of dice (*q.v.*). *See* Die-Sinking.

**Diebitsch, HANS KARL FRIEDRICH, COUNT (1785-1831).** Russian soldier. Born in Siberia, May 13, 1785, the son of a Prussian officer in the Russian army, he entered the same service, 1801, and fought at Austerlitz, Eylau, Friedland, and in the campaigns of 1812 and 1814. In the Turkish war of 1828-29 he was commander-in-chief of the Russian forces. His conduct of his army across the Balkans brought him the additional name of Zabalkanski (beyond the Balkans) and the rank of field-marshal. He died June 10, 1831.

**Diedenhofen.** German name for the town in Alsace-Lorraine better known as Thionville (*q.v.*).

**Diego Garcia.** Island of the Indian Ocean, a dependency of Mauritius. In lat. 7° S. long. 72° E.,

it is the southernmost of the Chagos group, has a good harbour, and exports coconut oil, copra, and guano. Length, 12½ m.; breadth, 6½ m. Pop. 501, mostly negroes from Mauritius.

**Diego Suarez.** Port of Madagascar, near the N. extremity of the island. It has a good harbour, and is the headquarters of the French military colony. Meat preserving is an industry. Following the British landings on Madagascar in the first days of May, 1942, Diego Suarez was captured on May 6, and next day the French naval and military commanders surrendered, whereupon the British fleet entered the port. During the attack on the port, two French submarines and an auxiliary cruiser were sunk. Pop. 12,237.

**Die-Hards.** Nickname of the Middlesex Regiment (*q.v.*). Originally the 57th foot, the regiment was at the battle of Albuera, May 16, 1811, when the colonel, though severely wounded, cheered on his men with the words "Die hard, 57th." Over 400 men of the regiment were killed in the action.

The nickname die-hards was applied in 1918 to the Conservative party section of Lloyd George's coalition government which desired a return to party politics. At first few in numbers and small in influence, they eventually found themselves in a majority of three to one and were then able to bring about the collapse of the coalition.

**Dielectric Heating.** A means of obtaining uniform heating throughout the bulk of a slab of material. Its action is dependent upon the power-factor of the substance, which, in practice, forms the dielectric of a condenser to which a high-frequency electric field is applied.

**Dielectrics.** Electrical insulating materials used, *e.g.*, to insulate the plates of a condenser or the copper core of a cable.

The dielectric constant of a material is defined as the capacity of a condenser with the material as dielectric to the capacity of the same condenser with air as dielectric. The development of plastics has produced a number of new dielectric materials which are particularly useful for high-frequency radio work. The dielectric constants of typical materials at a temperature of 18° C. are as follows:

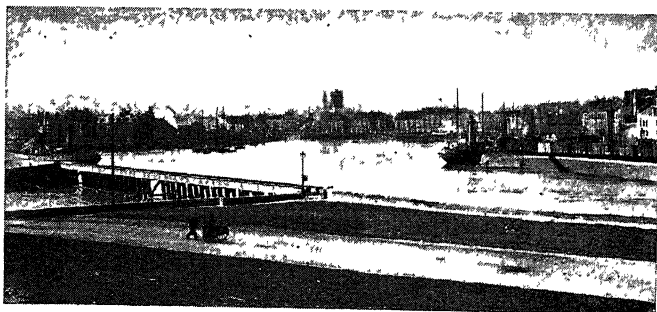
Amber	2.8	Ebonite	2.8
Sulphur	4.1	Flint-glass	7-10
Rubber	2.2	Polystyrene	2.2
		(or Distrene)	

Paraffined paper	2	Polythene	2.3
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The dielectric (or breakdown) strength of an insulating substance is measured by the value of the applied voltage gradient which causes a discharge to pass through the material. It is the particular property of an insulator which determines its suitability or otherwise for high-tension work.

**Dieppe.** Town and seaport of France. It stands where the Arques falls into the English Channel, by rly. 105 m. from Paris and 30 m. N. of Rouen, in the dept. of Seine Inférieure. It has a good, safe harbour, divided into an outer and an inner, and in 1939 was fitted with ample docks, quays, and all modern appliances. From here a regular service is normally maintained with Newhaven, 64 m. away, and other ports.

Dieppe is also a watering-place and a fishing town. For visitors there are a fine promenade, casino, good bathing, golf links, and other attractions. The chief buildings are the restored church of S. Jacques, the churches of Notre Dame de Bon Secours and S. Remy (the last damaged in the Second Great War), and the castle, with its massive defences. Other industries, in addition to the shipping, are the making of tobacco, cotton



Dieppe, Normandy. Pre-war view of the harbour; between this French port and Newhaven there is, in normal times, a regular cross-Channel service

spinning, and shipbuilding. There is a large fish market.

Dieppe was a place of some importance in Normandy, when the latter and England were united. A fortified town, it was besieged several times in the wars between England and France. Many French seamen were born here. It lost its prosperity after the revocation of the edict of Nantes (1685), as many of its inhabitants were Huguenots. It was burned down by the English in 1694 and remained in a state of partial decay until the 19th century, when increasing traffic and its attractions as a watering place gave it new life. Pop. 21,170.

**DIEPPE RAID, 1942.** The Germans occupied Dieppe in the Second Great War soon after the opening of their offensive of June, 1940, and converted it into a fortress, with the sea approaches covered by coastal batteries. On Aug. 19, 1942, a reconnaissance in force was carried out by Allied troops. This had as its objects: (1) testing the ability of the Allies to land a large force and tanks on a heavily defended sector of the coast; (2) testing the German defences on the N. coast of France; (3) discovering the strength of the Luftwaffe in Western Europe; (4) destruction of wireless stations, batteries, and German military equipment. The German commander in the west, von Rundstedt, believed this combined operation was the spearhead of an invading force, while in reality it was a rehearsal for the landings in N. Africa in Nov.

The attacking force, supported by the R.A.F. and the Royal Navy, numbered about 7,000 and consisted mainly of Canadians, with men of British and Fighting French commando units, and U.S. rangers. Five landings were made at dawn; but the convoy carrying the units to land near Berneval accidentally encountered German shipping a few miles off the coast and, reaching the beach nearly half-an-hour late, had to land in broad daylight in the face of heavy opposition from the aroused garrison. The six heavy guns of the battery at Berneval were never silenced, and kept up a steady fire on the men on the beaches and the ships offshore. The Canadians at Puys were unable to storm the strong-points on the eastern cliff above Dieppe, and these inflicted heavy casualties on the troops on the beaches.

The battery at Varengeville being destroyed by British commando troops, tanks were landed at Pour-

ville and Puys. The main beach at Dieppe was under heavy fire from the cliffs, the tobacco factory, and the casino. Some tanks got into the town, where a fierce battle raged round the casino, which had been converted into a formidable fortress. No artillery was landed, and what artillery fire was provided came from naval vessels, but this was scarcely effective. The German posts even withstood fire from the few tanks that did manage to overcome traps and obstacles.

Meanwhile the R.A.F. maintained an umbrella over the area, so that few German aircraft could penetrate to the beaches. By 10 a.m. German reinforcements were arriving, and the withdrawal began, covered by bitter rearguard actions, the R.A.F. and the Royal Navy. Fighting raged for nine hours; nearly half the attacking force became casualties, the courage of the Canadians refusing to admit the superiority of German reinforced concrete.

As well as providing much needed experience, the Dieppe raid fitted into the pattern of Allied offensive strategy in western Europe. The German high command now knew that the Allies could land powerful forces on the Channel coast; and the Russian campaign had set limitations on the German strength in the west, aggravating the problem of the defence of "fortress Europe." When the Allies landed in N. Africa in Nov., 1942, the Germans had to face the threat of attack in the south and at the same time be on guard against more and bigger "Dieppes," followed by invasion.

On Sept. 1, 1944, Dieppe was liberated by the same Canadian regiments as had suffered such heavy casualties during the 1942 raid. The town was largely undamaged, but the port and harbour installations had been destroyed. *Consult* *We Landed at Dawn*, A. B. Austin, 1943; *Rehearsal For Invasion*, W. Reyburn, 1943.

David Le Roi

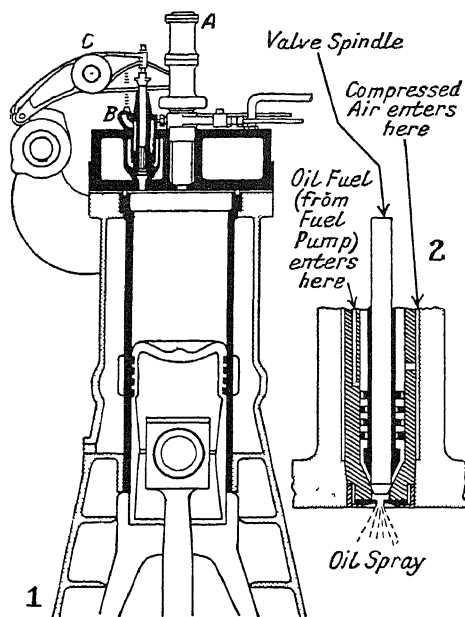
**Diesel, RUDOLF** (1858-1913). German engineer and inventor of the heavy-oil internal-combustion engine bearing his name. Born in Paris of German parents, Diesel studied engineering at technical colleges in Paris, Augsburg, and Munich. He patented the design of his engine in 1892, and built the first full-scale model in 1895. Diesel disappeared on Sept. 29, 1913, while crossing from Antwerp to Harwich. Not until after his death was his engine fully developed and the value of the invention realized.

**Diesel Engine.** Heavy-oil internal-combustion engine invented by Rudolf Diesel. It was known before Diesel's invention that if a charge of air is heated to a sufficiently high temperature, by rapid compression or otherwise, a spray of fuel oil injected into the charge will ignite and continue to burn as long as sufficient oxygen remains to support combustion. For very rapid combustion, however, two conditions must be satisfied: (1) the oil must be injected in a fine spray, i.e. it must be atomised; (2) each small particle of oil must be surrounded by air, i.e. either the spray must penetrate the charge of air or the air itself must be in a state of turbulence.

In Diesel's engine the air in the cylinder was compressed to 500-600 lb. per sq. in. and the fuel was injected by compressed air at 1,200 lb. per sq. in. The rate of fuel injection was adjusted so that combustion took place at approximately constant pressure, the point at which the fuel was cut off being arranged automatically to suit the load on the engine.

Since 1895, when the first Diesel engine was built, developments have been rapid, and engines of up to 12,000 h.p., with 6 to 8 cranks, have been installed in sea-going vessels. In 1910 the first ship to be fitted was the single screw coaster *Vulcanus*, with a six-cylinder engine developing 390 h.p. at 140 r.p.m. The first ocean-going ship was the *Selandia*, in which two sets of 8-cylinder engines developed a total h.p. of 2,340. In 1938, 20 p.c. of the world's tonnage was driven by Diesel engines. The main advantages are increased cargo space and considerably reduced fuel consumption as compared with steam-driven vessels. For a given size of engine the power can be increased by supercharging, the supercharger usually being driven by turbines actuated by the exhaust gases from the engine.

These engines are particularly adapted for efficient working on the two-stroke cycle. The types of engine in use are: (1) single-acting four-stroke; (2) double-acting four-stroke; (3) single-acting two-stroke; (4) double-acting two-stroke. All are in use for marine propulsion, particularly for large units. In the two-stroke engine valves and valve gears, including camshafts and drives, are either completely eliminated or greatly simplified, but effective scavenging of the exhaust gases by the incoming charge of air presents problems. Since the h.p. of a



1 Diesel Engine: original form. 1. Sectional view; fuel oil is delivered by pump to A, and sprayed in by compressed air; B, air inlet valve; C, cam and lever for valve operation. 2. Details of fuel pump and air-spray inlet

modern two-stroke engine is 60 p.c. greater than that of a four-stroke engine of the same size and speed, the complications in design to solve these problems have proved well worth while, though care is necessary with the cooling arrangements.

The use of compressed air for injection of fuel has been superseded by direct or airless injection of the fuel, the pressure of injection varying from 12,000 lb. per sq. in. in largest engines to about 2,000 lb. per sq. in. The development of reliable fuel pumps operating at these pressures accelerated the change-over and made higher speeds practicable. Mechanical efficiency is also improved by the elimination of the air compressor. These engines, however, do not operate on the true Diesel cycle. Much of the combustion takes place at constant volume; maximum pressures are higher. These engines are now commonly known as airless injection or compression ignition engines.

Diesel rly. engines have the advantages of low fuel consumption, absence of boiler, and consequent saving of water, all of value in countries where long periods of running are the rule and water is scarce. They can be started up from cold, saving time and additional stand-by expenses; and no fuel is consumed during stoppages.

Disadvantages are that the engine is essentially a constant speed unit; and is not self-starting, so that compressed air must be provided for starting. The first disadvantage is overcome either by change speed gearing and hydraulic clutches or by allowing the engine to drive a dynamo and using electric motors for the axle drive. Both methods are in use on Continental and American rlys. With airless injection much higher speeds are now practicable (up to 2,000 r.p.m.); the size of engine for a given h.p. may be reduced and engines of greater power may be accommodated in the limited space available.

Oil engines have been installed in power stations to work in parallel with existing steam plant in order to take temporary peak loads. They can be started up quickly and have no standby losses when not working.

Oil engines working on the compression-ignition cycle (usually single-acting four-stroke) have proved attractive propositions for commercial road vehicles and largely superseded petrol engines in the heavier goods and passenger types with engines running at 1,200–1,600 r.p.m. Their advantages are: (1) use of cheaper fuel; (2) the fuel does not give off inflammable vapour; (3) specific fuel consumption (lb. per hr. per h.p.) at full load is appreciably lower (about two-thirds); (4) specific fuel consumption of the oil engine does not increase greatly at the lighter loads, whereas that of the petrol engine increases rapidly as the load decreases. The Diesel engine has the disadvantage of a comparatively low mean pressure (about 90 lb. per sq. in.) in the cylinder, whereas 180 to 200 lb. is possible with petrol engines, which can also operate at much higher speeds (up to 4,000 r.p.m.). Size and weight of the engine being greater than with a petrol engine of corresponding power, the oil engine is not adapted for high speed motor cars;

but improvements in light materials of high strength and in injection devices are reducing this disadvantage.

Oil engines of the airless injection type commonly drive cement mixers, excavators, mobile cranes, grabs, farm tractors, etc.

A. T. J. Kersey

**Diesel Fuels.** Oils used in Diesel and other compression ignition engines. Large, slow, and medium speed engines of the industrial and marine type generally are not critical of fuel quality and utilise fuel oils (*q.v.*) with viscosities ranging from 100 to 1,000 seconds Redwood No. 1 at 100° F. High speed engines for road transport, which run on light oil of the gas oil (*q.v.*) range, are much more sensitive to the ignition properties of the fuels, which should have a cetane number (*q.v.*) of 50 or more.

**Diesel Index.** The product of the specific gravity of a Diesel fuel (expressed in American Petroleum Institute units) and its aniline point (in degrees F.), divided by 100. This is a rough guide to the ignition quality of the fuel. See Cetane Number.

**Die-Sinking.** Art of making the dies or tools by means of which metals are fashioned into definite forms by pressure applied either by a falling hammer or by some mechanical arrangement of levers or screws. It is an ancient art, and was apparently known to the Greeks 800 B.C. For many generations it was concerned solely with the production of coins and medals, and it was not until the 15th century that a German locksmith first used dies for the production of other metal objects, the first articles made by this process being door hinges.

In the old process of die-sinking, which is still in use to a limited extent, a short round bar of steel is taken, which, if the object for which the die is to be made is an ordinary silver coin, will be 2–3 inches in diameter, and 3–5 inches long. On one end a perfectly true face is turned, the turner using a powerful magnifying glass to secure the desired perfection. An exact copy of the design to be produced, made in lead pencil by the artist, is then transferred to the true face by first coating the latter with a film of wax and then pressing the pencil drawing upon the prepared face.

The engraver will then grave the faint lines of the design through the wax in order to fix them and follow by cutting out the whole design in the solid steel in intaglio,

i.e. by incising or recessing or *sinking*. These incised or sunk parts of the design are those which in the finished coin will stand up in relief. The cutting is done by small, fine, and hard steel chisels, and is a process calling for great skill.

The die so made will rarely be the one used for the production of the coin, as dies quickly become worn. A copy of the original die is therefore made by stamping the design by means of the original die, properly annealed and hardened, into a block of soft steel called the puncheon, which in its turn is hardened and then used in a similar manner to make working dies.

The modern mechanical process is a particular application of the well-known copying lathe. A model three or four times as large as the design required is made in wax, and by means of delicate mechanism a fine drill revolving rapidly is made to follow the surface of the model and thus to cut out the design, of the proper dimensions, pantographically, in a soft steel block or hub, from which working dies are made in the usual way. Vast numbers of dies are made by processes of cutting or sinking analogous to those described, usually with drills, shaping machines or milling cutters, for the production of buttons, spoons, forks, metal pans and cups, silver plate, ornaments, etc.

**Dies Irae** (Lat., day of wrath). Opening words of a Latin hymn, said or sung as a sequence in the Roman Catholic Church on All Souls' Day and at funeral masses. Evidence favours the authorship of Thomas of Celano, a 13th century Franciscan. The first 17 stanzas are double-rhymed triplets and the last two four-rhymed couplets, with two unrhymed lines at the end. No hymn has been so often translated, and more than 200 English renderings are in existence, the best known being that of J. M. Neale, used in the Church of England. Scott paraphrased part of it in the *Lay of the Last Minstrel*, and Goethe introduces the hymn in *Faust*. The subject of the *Dies Irae* is the Last Judgement, and its deeply emotional nature—terror of the day of wrath gradually merging into hope of salvation and eternal rest—has inspired many composers, notably Gounod in his *Mors et Vita* and Mozart in his *Requiem*.

**Diestian**. Lowest geological formation in the Pliocene deposits of Belgium and the Netherlands. It indicates an age when those

lands as well as S.E. England were contemporaneously submerged. Its marine sands contain numerous fossils traceable from the Netherlands through Antwerp, Boulogne, and Folkestone to Lenham, on the edge of the Kentish chalk. These Lenham beds represent a vast English Diestian deposit which, except for them, has entirely disappeared. The name is derived from Diest, a town 20 m. N.E. of Louvain, Belgium.

**Diet**. Regulation of personal feeding with a view to correct balancing of constituents, and the maintenance of health. (For problems of diet, see under Food and Nutrition.)

Knowledge of food values and of the preparation of food substances becomes especially important during ill health and recovery therefrom. No longer does a meal for the sick consist of a piece of white fish, a white vegetable covered with a white sauce, and a white milk pudding; care is taken to provide a colour scheme that interests the eye, flavours that pique the appetite, and difference in the texture of the foods offered. As few pathological conditions do not require an appropriate diet, all well organized hospitals and clinics have a trained dietician on the staff.

In a disorder of metabolism like diabetes the carbohydrate intake must be balanced against the blood sugar curve of the patient and his insulin dosage; diet in a wasting disease such as tuberculosis must be rich in material for the rebuilding of tissue; diseases due directly to vitamin deficiencies like scurvy and rickets demand food to make good the recognized lack. Impaired liver function necessitates the absence of fat and raw milk from the diet; impaired kidney function is helped by a protein intake.

**Diet**. In constitutional history, an assembly of those responsible for the government of a country, or the estates as they are sometimes called. The word has come to be used for the various assemblies known in Germany as Tag, Reichstag, Landtag, and others. The nearest English equivalent is parliament, although diet does not carry necessarily the idea of an elected assembly.

The chief diet was that of the Holy Roman Empire, the Reichstag or imperial diet, consisting of three colleges or estates; its famous meeting at Worms (*q.v.*) was in 1521. Another was the Reichstag of

the German Empire of 1871–1918, and there were local diets in the various states of Germany and the provinces of Austria-Hungary, while the term was also used for the parliaments of Poland and other countries. The Germanic Confederation of 1815–66 had its diet or Bundestag. The word diet in this sense, and also in that of a special course of food, is derived from Gr. *diaita*, late Lat. *diaeta* (mode of life), which, popularly associated with Lat. *dies* (day), came to bear the sense of a day's ration; a day set apart for certain business, and hence a meeting for transacting such business. See Bundestag; Estates; Landtag; Reichstag.

**Dietetics**. This practical application of the science of nutrition is dealt with under Food and Nutrition.

**Diethylene Glycol Dinitrate**. Liquid explosive which has been used as a substitute for nitroglycerine in propellants. It is a viscous colourless liquid, slightly soluble in water; has a low vapour pressure (0.007 mm. at 22.4° C.), and freezes at –11.5° C.; is miscible at ordinary temperatures with nitroglycerine, ether and acetone, and methyl alcohol; is much less sensitive than nitroglycerine, and rapidly gelatinises collodion cotton. It is made by nitration of diethylene glycol, which can be readily synthesised from ethylene. This makes it of high potential value in propellant manufacture if insufficient fats are available for glycerol.

**Dietl**, EDUARD (1890–1944). German soldier. He was born July 21, 1890, at Aibling, Bavaria. In the First Great War he served with distinction and in 1919 fought the Bavarian Socialist government. A convinced Nazi, Dietl commanded a battalion of mountain troops in 1931, and in 1938 took part in the invasion of Austria. As major-general, he was in the attack on Poland in 1939, and in 1940 played a great part in the Norwegian campaign, being responsible for taking Narvik, and holding in Nazi propaganda a position second only to that of Rommel. In 1942 he had become colonel-general and was in command of the Lapland army. He was killed in an air accident near Vienna, June 23, 1944.

**Dietrich**, MARLENE (b. 1902). German-American film actress. Born in Berlin, Dec. 27, 1902, she sprang to fame in the German film *The Blue Angel*, with Emil Jannings, in 1930. She went to



Hollywood, where in a series of films designed to enhance her blonde appearance she became the most famous of the screen's glamour stars, her popularity rivalling that of Greta Garbo (*q.v.*). Films in which she appeared included *Shanghai Express*, *Song of Songs*, *The Blonde Venus*, *Seven Sinners*, *Destry Rides Again*, *The Spoilers*, *Kismet*.

**Dietrich, Otto** (b. 1897). German politician. He was born Aug. 31, 1897, and became a journalist in the Ruhr. In 1931 he was made head of the press organization of the Nazi party, and in 1933 vice-president of the national press chamber. Goebbels secured his dismissal, March 30, 1945. For inciting Germans against Jews and directing the anti-Jewish campaign, he was sentenced to 7 years' imprisonment by a U.S. military tribunal at Nuremberg, April 14, 1949.

**Dietsch.** Term used by the Dutch Nazi party before the Second Great War as a common name for a "greater Netherlands" embracing the Flemish peoples of the Netherlands and Belgium. The movement had the support of Hitler until he invaded the Netherlands in May, 1940.

**Dieu et Mon Droit** (Fr., God and my right). Watchword or parole given to his army by Richard I at the battle of Gisors in 1198. After the defeat of the French he took the words for his motto, to emphasise the fact that he disowned any vassalage to France, but held his right from God alone. The phrase was adopted by Henry VI and has remained the motto of his successors on the English throne, being still inscribed on the royal standard.

**Dieulafoy, Auguste Marcel** (1844-1920). French archaeologist and engineer. Born at Toulouse, Aug. 3, 1844, he served as a civil engineer in Algeria and Haute-Garonne. At Susa he unearthed, in 1884-86, the palace of Darius I and Artaxerxes Mnemon. His wife, Jane Dieulafoy, who accompanied him, published the journals of their expeditions. His works include *L'Art Antique de la Perse*, 1884-89; *Le Château Gaillard et l'Architecture Militaire*, 1898; *La Statuaire Polychrome en Espagne*, 1903; *La Mausolée d'Halicarnasse*, 1911. He died in Paris, Feb. 26, 1920.

**Diez, Friedrich Christian** (1794-1876). German philologist. Born at Giessen, March 15, 1794,

and educated there, from 1830 he was professor of Romance languages at Bonn. The founder of Romance philology, he did for the Romance languages what Grimm did for the Teutonic and Bopp for the Indo-European languages generally. His two great works are *Introduction to the Grammar of the Romance Languages*, 1836; and *Etymological Dictionary of the Romance Languages*, 1853. He died May 29, 1876.

**Differences.** A term used in mathematics. Finite differences are the differences which occur successively in the terms of an algebraic series. The method which deals with them is called the calculus of differences or the theory of finite differences. Consider a series consisting of the terms, 1, 4, 9, 16, 25, etc., of which it was desired to discover the subsequent terms. The first differences of the series are obtained by subtracting from each term the term immediately preceding it. A new series then arises: 3, 5, 7, 9, etc. If this is treated in the same way we arrive at the second differences of the original series. In the example chosen the second differences form the series 2, 2, 2, 2. This series suggests a law of formation of the original series and enables us to continue it.

**Differencing.** In heraldry, a method adopted for distinguishing armorial bearings of various members of a family, or of arms assumed by feudal dependants or clients. It goes much farther than cadency, but takes many forms. Sometimes the tinctures are varied, sometimes the lines of demarcation or the outlines of the ordinaries are varied, these from plain being given as indented, wavy, nebuly, and so on. Some differences are merely temporary, or personal; thus a bishop may add a crosier or a mitre to his paternal arms. *See* Cadency; Heraldry.

**Differentia.** In logic, the essential quality which distinguishes one species from the other species of the same genus or one individual from another.

**Differential Calculus.** In mathematics, the study of the rules and processes for obtaining the differential coefficients of functions of variable quantities. *See* Calculus.

**Differential Equation.** An equation involving differentials—i.e. infinitesimal differences between consecutive values of a continuously varying quantity. It can be defined more strictly as a relation between one or more func-

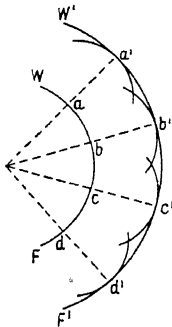
tions and their differential coefficients. *See* Calculus; Equation.

**Differentiation.** Biological term signifying the process as the result of which tissues of living creatures become distinct from each other. In non-cellular forms there is little differentiation of structure or function. The whole organism performs all the functions necessary to life. In cellular organisms, however, different cells become set apart for different duties, so that quite low in the scale of creatures we find special organs of generation, locomotion, and so forth. *See* Cell; Evolution.

**Differentiation.** In geology, the production of different types of igneous rock from the same parental magma or melt. Various processes have been invoked to account for this phenomenon. The one most commonly accepted is crystal sinkage. When molten rock-matter cools slowly in the earth's crust, the first minerals to form are those having the highest melting point. These are rich in magnesium, iron, and lime, but poor in silica and alkalis. They have a relatively high density, higher than the fluid which surrounds them. In consequence they may sink through the liquid, which becomes enriched in those constituents which are not removed. The original melt is thus split into two (or more) fractions, one of which is made up of fluid plus the heavy early formed crystals, while the other lacks the constituents of the crystals which sank. Intrusion as dykes or sills, or extrusion as lavas through a volcano, of the two fractions would yield rocks of differing constitution but derived from the same parental source. Many geologists believe that, in the earliest days of the earth's history, the light granitic crust which now forms the main mass of the continents, and rests on a heavier and more basic substratum, was produced by processes similar to those outlined.

**Diffraction.** A term used in physics. If plane waves generated in a pool of water are incident upon a vertical board which contains a narrow vertical slit, the waves emerging from the farther side are not limited to a narrow beam but spread out approximately as circles with the slit as centre. This result is in support of Huyghen's assumption that each point on a wave-front can be treated as a source of secondary waves, *e.g.* in the figure, each point, a, b, c, d, etc., in the wave-

front  $W F$  gives rise to secondary wavelets which combine to form at a later instant the wave-front  $W' F'$ . These wavelets mutually interfere except at the points  $a^1, b^1, c^1, d^1$ , etc., where they touch the wave-front. As in Huyghen's construction, if the number of slits is increased the emerging wave-fronts become more nearly straight.



Diffraction. Diagram to illustrate the term. See text

This departure from rectilinear propagation, or diffraction, depends upon the length of the waves in relation to the size of the object or opening. The phenomenon is met with more frequently in everyday life with sound than with light waves, since the former are of longer wave-length and thus more comparable with the size of ordinary objects. Study of diffraction, however, led to the conception of rays of light, which forms the basis of geometrical optics. Shadows cast by light are usually sharp; but if a straight edge is set up parallel to a narrow illuminated slit and the shadow cast is received on a screen just behind the edge, the shadow will not be sharp. Instead a number of alternate bright and dark parallel bands will be seen outside the geometrical shadow, while within it the light will shade off gradually. These light and dark bands are known as diffraction bands and may be obtained in many other circumstances, e.g. when a needle (or wire) is illuminated by light from a parallel slit.

**Diffraction Grating.** A device in which a number of similar obstacles are arranged at equal distances apart, and (in a plane grating) all in one plane. A plane wave-front falling on such a grating sets up secondary wavelets at the spaces between the bars; the wavelets either reinforce or destructively interfere with one another. For use with light waves the grating consists of parallel lines (up to 40,000 per inch) ruled on glass or on speculum metal; when white light is employed the diffracted beams will give rise to a series of spectra on a suitably placed screen. The employment of a plane grating in

conjunction with a spectrometer allows very accurate measurement of wave-lengths of spectral lines. Concave gratings are also utilised. Diffraction gratings for sound experiments to obtain acoustic spectra may be constructed from metal strips or wires fixed in a framework parallel to one another and at a constant distance apart.

**Diffusion** (Lat. *diffundere*, to spread by pouring out). The intermingling of gases. If two bottles of the same size, one containing hydrogen and the other carbon dioxide, are placed mouth to mouth with the hydrogen bottle on top, after a time it will be found that half the hydrogen has travelled into the lower bottle and half the carbon dioxide has ascended into the upper one—although carbon dioxide is twenty-two times as heavy as hydrogen. A gas diffuses into a space already filled with another gas just as if this gas did not exist in the space.

If two liquids which will mix are introduced into a bottle so that the denser is below and the lighter above, then, as with gases, diffusion will take place. The rates at which liquids diffuse are, however, all extremely slow when compared with those of gases, and differ greatly.

In metallurgy, diffusion has several practical applications, for the carburising and case hardening of mild steel is brought about by introducing carbon into the surface and allowing it to diffuse towards the interior under the influence of high temperature. In annealing, a heterogeneous structure may be rendered more uniform in composition by this process. In powder metallurgy, diffusion is relied upon to give a uniform material resembling in structure and properties a wrought alloy of the same composition.

**Digamma** (double gamma). Sixth letter of the old Greek alphabet, formed by placing one gamma ( $\Gamma$ ) above another ( $\Gamma$ ). Its original name was Vau, and its sound approximately that of English W. In the Latin alphabet the form, but not the sound, was preserved as F. It gradually disappeared in Greek, but its influence may be seen by comparing Greek *oikos* with Latin *vicus* (English, -wick), *Hestia* with *Vesta*, *Hesperus* with *Vesper*.

**Digastric Muscle** (Gr. *di*, double; *gaster*, belly). Muscle attached to the mastoid process (a bony protuberance which lies behind the ear) and to the inner side of the lower jaw. A tendon passes

from the centre of the muscle to the hyoid bone in the upper part of the front of the neck. Its action, when the posterior part is fixed, and the hyoid bone is depressed, depresses the lower jaw, and, when the lower jaw is fixed, raises the hyoid bone.

**Digby.** Town of Nova Scotia, Canada, capital of Digby co. It is on Annapolis Basin, an inlet of the Bay of Fundy, 150 m. W. of Halifax, with which it is connected by rly. The harbour is virtually landlocked, and the chief occupations are herring fishing and curing. Pop. 1,657.

**Digby, Sir Everard** (1578–1606). English conspirator. Born May 16, 1578, the son of a large landed proprietor, he became a Roman Catholic, and in 1603 was knighted by James I. Catesby, needing money, persuaded Digby to join the Gunpowder plot in Oct., 1605, and to prepare a rising in the Midlands. When the plot failed, Digby rode off with some of his accomplices to Holbeche, Staffordshire, where he was captured. He was imprisoned for two months in the Tower, and then tried. He pleaded guilty, and was executed in S. Paul's Churchyard, Jan. 30, 1606. See Fawkes, Guy; Gunpowder Plot.

**Digby, Sir Kenelm** (1603–65). English author, naval commander, and diplomat. Born July 11, 1603. the son of Sir Everard Digby, he was educated at Gloucester Hall (Worcester College), Oxford. In 1623 he was knighted, and in 1625 he married the celebrated



Kenelm Digby  
After Van Dyck

Venetia Stanley. In 1628, in command of a privateering expedition, he defeated a French and Venetian squadron off Alexandretta. As a Roman Catholic, he incurred the suspicion of the Long Parliament, 1642–43, was imprisoned, and was exiled to France, where he became chancellor to Queen Henrietta Maria. This office he continued to hold after the Restoration, in spite of the fact that, on a visit to England, 1654–56, he had carried on negotiations with Cromwell. He died June 11, 1665, and was buried in Christ Church, Newgate. Of his numerous scientific and philosophic writings the best known are *Observations* (1643) on Sir Thomas Browne's *Religio Medici*,

and Two Treatises: Of Bodies, and of Man's Soul, 1644. He was one of the earliest F.R.S. Consult Sir Kenelm Digby and his Venetia, E. W. Bligh, 1932.

**Digestion** (Lat. *digerere*, to carry apart, divide). Process by which food is reduced by organs to a chemical condition in which it can be absorbed and used by the body tissues as a source of energy and structural formation and repair. See Food and Nutrition.

Indigestion is the condition known as dyspepsia (*q.v.*).

**Digger.** Agricultural implement for turning up the soil. It has either a wheel fitted with blades like ploughshares, which lift and turn over the earth as the machine is drawn along, or a series of blades which go into the ground and are drawn out with a twist. Single-furrow ploughs with short breasts for wide broken work, which throw over the soil with a spade-like motion, are also called diggers. The term is further used for an apparatus which digs up potatoes. In this case a broad iron blade goes into the ground under the potato plant and lifts it up, while a revolving wheel with a series of forks throws the potatoes to the side, a wooden screen hanging out from the machine on a rod preventing the potatoes from being thrown too far.

The colloquial term digger signifying an Australian was introduced during the First Great War and is still occasionally heard.

**Digges**, LEONARD (d. c. 1570). English mathematician. Born at Barham, Kent, and educated at University College, Oxford, he devoted his time and ample means to scientific pursuits. He anticipated the discovery of the telescope. His works are *A Prognostication Everlasting Contayning Rules to Judge the Weather*, 1553; *Tectonicon, Briefly Showing the Exact Measuring and Speedie Reckoning all Manner of Land, Squares, Timber, Stone, etc.*, 1556; and the posthumous *Geometricall Practise Named Pantometria*, 1571; and *Arithmeticall Militare Treatise Named Stratoticos*, completed by his son, who was also a distinguished mathematician.

**Digit** (Lat. *digitus*, a finger). Name for a single numeral, as 0, 1, 2, up to 9; or as a measure, a finger's breadth. In astronomy a digit represents the twelfth part of the diameter of the sun or moon. See Arithmetic; Decimals.

**Digitalis** (Lat., of the finger). Genus of biennial and perennial herbs of the family Scrophularia-

ceae, of which the foxglove (*Digitalis purpurea*) is a familiar example. Natives of Europe, N. Africa, and W. Asia, they have crowded leaves forming a rosette in their first year, but later develop a tall, flowering stem, with bell-shaped, tubular flowers adapted for fertilisation by bees. Another variety, *D. lanata*, the glucosides of which have been a subject of study is a plant about 3 feet tall and found in Central Europe.

The leaves of the foxglove contain several powerful principles which render them valuable in certain forms of heart disease. The dried, powdered leaves may be administered, or the infusion or tincture prepared from the leaves. Several active principles have been extracted, some in crystalline form. Digitalis acts upon the heart by increasing the force of its beat and slowing its action; the degree of the latter effect varies according to the type of abnormal condition of the heart. In some forms of irregular heart action it tends to reduce and sometimes abolishes the irregularity.

Digitalis accumulates in the body, and, if taken for longer periods, may set up symptoms of poisoning—nausea, loss of appetite, vomiting, slow pulse, irregular heart beat, faintness, giddiness; patients vary greatly in their susceptibility to the drug and the kind of symptoms they develop.

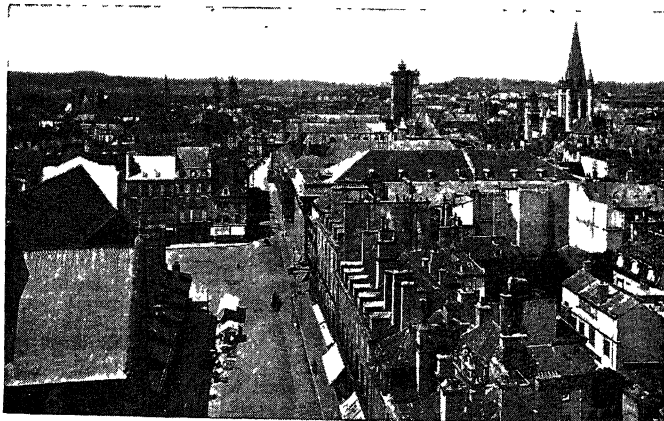
The patient should be kept lying down, external warmth applied, and brandy or hot coffee administered. When the symptoms are due to taking a single large dose, the stomach should be washed out or an emetic given, unless there has been profuse vomiting. See Foxglove.

**Digitigrade Animals** (Lat. *digitus*, finger, toe; *gradi*, to walk). Term applied to animals, such as the dog, which walk on their toes, as contrasted with plantigrades, such as the bear, which walk on the whole undersurface of the feet.

**Dihedral** (Gr. *di*, double; *hedra*, seat). Angle between any two surfaces. In aeronautics, the angle at which both port and starboard wings of an aeroplane or glider are inclined upwards or downwards to the transverse axis. If the inclination is upward, the dihedral is positive. See Aeronautics; Angle (and illus.).

**Dijon.** City of France, capital of the dept. of Côte-d'Or. It stands under the Côte d'Or mts., where the Ouche and the Suzon rivers meet, and also on the Burgundy Canal, 210 m. by rly. S.E. of Paris. It was once the capital of Burgundy. There is little left of the palaces of the dukes, but some of their fine tombs remain. The cathedral of S. Bénigne, once an abbey church, dates from the 13th century. Notre Dame, with its wonderful W. front and an old clock, is noteworthy, as are S. Michel and S. Jean.

The hôtel de ville houses one of the most complete collections of paintings, etc., outside Paris; here are also antiquities and the city's archives. Other buildings are the palais de justice, where the parliament of Burgundy sat, and an exchange, once a church. There are remains of the Chartreuse, built by Philip the Bold for a mausoleum. Dijon has a university, founded 1722, with faculties of law and science. It is the rly. junction where the route from Paris to Marseilles reaches the Rhône valley, has a trade in wine and agricultural produce, and



Dijon. General view of the French city looking west from the church of S. Michel. The twin towers in the distance are those of the cathedral

manufactures tobacco and flour. Its liqueur is famous.

Dijon was a Roman settlement, but the years of its glory were about 1360-1477, when the dukes of Burgundy lived there. It was afterwards the residence of the princes of Condé. The Germans met with a stout resistance here in 1870-71. Dijon was occupied by the Germans, June 18, 1940, but later included in Vichy France. The airfield and rly. were bombed by Allied air forces. French troops occupied Dijon, Sept. 11, 1944, the Germans retreating towards the Belfort Gap. Pop. 100,664.

**Dikoa** or **DKWA**. Town of Nigeria, in the district (formerly native state) of Bornu. It lies 26 m. S. of Lake Chad. The former palace of Rabah is now the government house. The sultan of Bornu resides in the town, and the inhabitants are Mahomedans.

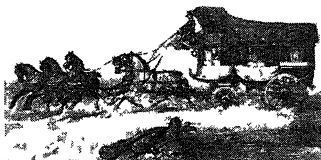
**Dilapidation** (Lat. *dī*, apart; *lapis*, a stone). Term used in general for the act of allowing a building to fall into decay or ruin. In ecclesiastical law its plural, dilapidations, has a significance of its own. A rector, vicar, or other incumbent, being legally a tenant for life, is bound to maintain and keep in proper repair his rectory, vicarage, or other official residence, and all buildings belonging to the house or glebe. In the Middle Ages a rector, but not a vicar, was also responsible for the chancel of the church. Later this was generally chargeable to church rates or voluntary gifts. Since 1940 the repair of the chancel is provided for by a special fund administered by the diocesan authority. Under Church Assembly Measures 1924 and 1929 the rest of the incumbent's responsibility for dilapidations is covered by a similar fund to which he contributes.

**Dilancy**. Term applied by Osborne Reynolds, F.R.S. (1842-1912), in considering arrangements of particles (such as atoms), the alteration of which would alter their shape or bulk. The dilancy of a grouping of granular masses or particles would be due to the increase of space between these rigid particles when the grouping was changed.

**Dilemma** (Gr. *dilēmma*, double assumption). In logic, a form of contradiction in which it is shown that the proposition to be contradicted can be correct only under one of two equally impossible suppositions. An example of one kind of dilemma is: if A exists, then either B or C exists; but neither B nor C exists, therefore A does not

exist. In ordinary language, a state of things in which only two courses of action are open, both equally undesirable. The "horns" of the dilemma are the two assumptions, from either or both of which an unacceptable conclusion follows. The idea is that a person is caught between (Gr. *dialambanesthai*) two difficulties, the Latin equivalent *complexio* (grasping) bearing the same meaning. See Logic.

**Diligence**. Stage coach once much used on the Continent, and in America; also in England from the middle of the 18th century, until superseded by steam trains. The large diligence was drawn by from four to seven horses, and weighed, with its freight, five tons. It had three compartments, the *coupé* in front for three passengers, the middle coach for six, and the *rotonde* behind for another six. In addition to these, behind the bench on which the conductor sat, which itself was behind the driver's seat, was a space in which the luggage was packed. The small diligence had only two compartments, the *coupé* and the middle or in-



Diligence. A form of stage coach

*terieur*. The word diligence appears at one time to have had the meaning of dispatch, haste. See Coach.

**Dilke, CHARLES WENTWORTH** (1789-1864). British critic and journalist. Born Dec. 8, 1789, he entered the Navy Pay Office, but his main interest was in literature, although he remained in the civil service until 1836. He acquired the Athenaeum in 1830, edited it until 1846, and was manager of the Daily News, 1846-49. He edited Old English Plays, 1814-16; and wrote on Pope, Junius, and Wilkes. He died at Alice Holt, Hants, Aug. 10, 1864. His collected articles were published in 1875, as Papers of a Critic, edited by his grandson, Sir Charles W. Dilke. His son Charles Wentworth Dilke (1810-69) was made a baronet in 1862.

**Dilke, SIR CHARLES WENTWORTH** (1843-1911). British politician. The son of Sir Charles Wentworth Dilke (1810-1869) and the grandson of Charles Wentworth Dilke, he was born in London, Sept. 4, 1843. Educated at Trinity Hall, Cambridge, he showed himself a bril-

liant scholar and also something of an athlete, and on leaving the university was called to the bar. In 1869 he succeeded his father as 2nd



Sir Charles Dilke, British politician  
London Stereoscopic Co

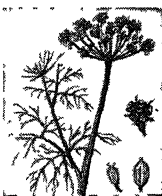
baronet and chief proprietor of the Athenaeum and Notes and Queries. In 1868 he entered parliament as M.P. for Chelsea. Closely associated with Chamberlain, the two entered Gladstone's ministry in 1880, Dilke becoming under secretary for foreign affairs. In 1882 he entered the Cabinet as president of the Local Government Board, and the highest honours of political life seemed to be within his reach.

In 1885 Dilke's official career was ended by his appearance as co-respondent in a divorce case. In 1892 he was M.P. for the Forest of Dean, Chelsea having rejected him in 1886. Chelsea elected him once more in 1905, but he had no further influence, and died Jan. 26, 1911. His wide knowledge of foreign and colonial affairs was set out in The Present Position of European Politics, 1887; Problems of Greater Britain, 1890; The British Empire, 1899. A Life of Dilke by S. Gwynn and G. M. Tuckwell (2 vols.) appeared in 1917.

**Dilke, EMILIA FRANCIS, LADY** (1840-1904). British art critic. A daughter of Major Henry Strong, of the Indian army, in 1861 she married Mark Pattison. After his death she married, in 1885, Sir Charles Dilke. In addition to acting as art critic to the Academy, she gave considerable support to the formation of women's trade unions. Her last work, The Book of the Spiritual Life, 1905, contained a memoir by Sir C. W. Dilke.

**Dill** (*Anethum graveolens*). An annual herb, one of the family Umbelliferae. It is a native of S.

Europe and Asia, with leaves much divided into very slender lobes. The minute yellow flowers are disposed in umbels. The small flat-tish fruits are the dill "seed" of commerce, used for distilling oil of dill and for making the carminative dill-water.



Dill, an annual herb

**Dill**, SIR JOHN GREER (1881-1944). British soldier. Born at Lurgan, co. Armagh, Dec. 25, 1881, he was educated at Cheltenham College and the Royal Military College, and served on the Western Front throughout the First Great War. Director of military operations and intelligence in 1933, he was appointed G.O.C.-in-C., Aldershot, in 1937, and knighted that year. At the outbreak of the Second Great War he went to France as commander of the 1st corps; on May 26, 1940, he succeeded Lord Ironside as chief of the imperial general staff, retiring Dec. 25, 1941. Dill was promoted field-marshal and it was announced that he had been named governor-designate of Bombay, but he was given special employment in Washington. Sir John accompanied Winston Churchill on his visit to President Roosevelt and remained at Washington as head of the British joint staff mission. He died there on Nov. 4, 1944, and was buried in the Arlington National Cemetery.



Sir John Dill,  
British soldier

**Dillenius**, JOHANN JACOB (1687-1747). German botanist. Born at Darmstadt, of German parents, he was educated at Giessen in Upper Hesse. Dr. W. Sherard, consul at Smyrna (Izmir), induced Dillenius to come to England. He published *Hortus Elthamensis*, 1732, and *Historia Muscorum*, 1741. Sherard left £3,000 to found a chair of botany at Oxford, to be held in the first instance by Dillenius, who retained the position from 1734 until his death, April 2, 1747.

**Dillinger**, JOHN (1902-1934). U.S. criminal. Son of an Arizona farmer, he killed 14 people during a long career of robbery and murder, becoming described officially in the U.S. as Public Enemy No. 1. Betrayed by a former mistress, he was shot dead by Federal agents on July 22, 1934, while resisting arrest after leaving a cinema in Chicago.

**Dillon**, ÉMILE JOSEPH (1855-1933). Irish scholar and journalist. Brother of John Dillon, he was born in Ireland, and educated at the Collège de France, Paris, and at several European universities. He became an authority on Oriental literature, and was Russian correspondent to the Daily Tele-

graph, 1887-1914. One of the best known journalists of the day, he reported the Armenian atrocities, 1895; the Boxer rising, 1900; the Portuguese revolution, 1910; and the peace conference, 1919. His many books included *Maxim Gorky*, 1902; *The Future of Mexico*, 1921; *Leaves from Life*, 1932. He died June 9, 1933. *Consult* Life, H. Baerlein, 1947.

**Dillon**, JAMES MATHEW (b. 1902). Irish politician. Born in Dublin, he was son of John Dillon (*v.i.*). Educated at Mt. S. Benedict, co. Wexford, and the national university of Ireland, he was called to the Irish Bar, and elected to Dáil Eireann as Independent deputy for co. Donegal in 1931. He founded, with Frank MacDermott, the National Centre party, by which he was returned for Donegal in 1933. When this party, the League of Youth, and the Cumann nan Gaedheal combined to form the Fine Gael party, he was chosen vice-president. After O'Duffy's resignation, 1938, Dillon became deputy leader of the opposition, but resigned 1942 in protest against the party's neutrality policy. Elected 1942 and 1948 as Independent for co. Monaghan, to which constituency he had transferred in 1937, he became minister for agriculture in Costello's coalition, 1948.

**Dillon**, JOHN (1851-1927). Irish politician. A son of John Dillon, M.P., a leader of the Young Ireland party, he was educated at the university of Dublin, and became a doctor of medicine. In 1880 he entered the house of commons as M.P. for Tipperary, and was imprisoned as an ardent Nationalist. During 1883-85 he was on a ranch in Colorado but in 1885 was returned for East Mayo, which he represented for over 30 years.

Dillon was one of the most active spirits of his party. He took part in the movement called the plan of campaign, was more than once in prison, and was suspended in the house of commons for violent language. He succeeded Justin M'Carthy as chairman of the Irish parliamentary party in 1896, resigning in 1900 so as to bring about reunion with the Parnellite minority group. John Redmond, who had a moderating influence upon Dillon, constantly

consulted him, and in March, 1918, on Redmond's death, he was chosen leader of the Nationalists, but the triumph of Sinn Féin left him almost without a following. He died Aug. 4, 1927.

**Dilly**. Capital and chief seaport of Timor, Portuguese E. Indies. It is on the N. coast of the island. In the Second Great War the Japanese, landing near on Feb. 20, 1942, secured the aerodrome, and occupied Portuguese, as well as Dutch, Timor. Pop. 3,500.

**Dilolo**. Marshy lake of Angola. It lies at an alt. of 4,695 ft., near the S. border of the Belgian Congo, and is one of the feeders of the Zambezi. Livingstone discovered it, Feb. 20, 1854.

**Dilution** (Lat. *dilutum*, p.p. of *diluere*, to wash away). Term normally used to indicate the addition of a diluent to a strong liquid to make it weaker. Applied to labour, it means the weakening of the professional status and earning capacity of the specialised worker by allowing semi-specialised or non-specialised workers to perform the same duties. As occupations and professions emerge and become more capable of clear definition, members combine and with varying success form with legal recognition "closed shops."

In Great Britain, doctors, barristers, and clergymen have secured legal definition of their status, and dilution is illegal. Accountants have attempted to do the same. Teachers are unable to form a profession because the state periodically lowers qualifications and standards of entry if there is a shortage of recruits. Among industrial workers there is much more difficulty because skills are difficult to define on paper, and machines are constantly replacing manual skill. In some professions, e.g. journalism, sport, music, nursing, the entrance of amateurs or semi-professionals creates a formidable problem. Extensive dilution weakens craft unions, but in the newer industrial unions, e.g. in the civil service, definition of grade duties, with or without graduated examinations, makes it possible to define status.

**Diluvium** (Lat., *deluge*). Coarse detrital matter deposited by powerful water-action such as sudden and violent floods. The word, used by Dean Buckland in 1823, in his *Reliquiae Diluvianae*: Organic Remains attesting action of a Deluge, embodied the belief then current that the boulder-clay of the glacial drift proved the Noachian deluge to have been universal.



John Dillon,  
Irish politician  
Haines

The diluvial period is now usually denoted by Lyell's word Pleistocene. See Alluvium.

**Dimazon.** A coal tar product sometimes used, in the form of a 2 p.c. ointment made with soft paraffin, for the treatment of burns, wounds, and skin diseases.

**Dime.** Silver coin of the U.S.A. It is a ten-cent piece, the tenth part of a dollar, and is about the size of a British sixpence.

**Dimension** (Lat. *dimensio*, a measuring off). In geometry or mensuration, a magnitude measured in a given direction. A point has no dimensions. A line has length only, and is therefore of one dimension. A surface has length and breadth—two dimensions. A solid has length, breadth, and thickness—three dimensions. When algebraic expressions were used to represent geometrical figures the idea was extended to them, so that an equation such as  $ax + by = c$  became an equation of one dimension, a quadratic equation  $ax^2 + by^2 = c$  an equation of two dimensions, and an equation in which any variable is of the  $n$ th power, an equation of  $n$  dimensions. See Fourth Dimension; Geometry.

**Dimethylaniline** ( $C_6H_5N(CH_3)_2$ ). Important compound of the group known as alkylanilines. Actually it is aniline in which both hydrogen atoms of the amino group have been replaced by methyl groups. In commercial practice it is prepared by heating aniline with methyl alcohol and hydrochloric acid at  $200^\circ$  to  $250^\circ$  C. until reaction is complete. It is a colourless, strongly basic oil, boiling at  $192^\circ$  C. and having a specific gravity of 0.9567 at  $23^\circ$  C. It is extensively used as an intermediate in the dyeing industry and is the raw material for the manufacture of tetranitromethylaniline (*q.v.*).

**Dimetian.** Name applied by the geologist H. Hicks, F.R.S. (1837–99), to the lowest of three series of pre-Cambrian age which he claimed to have localised in the ancient volcanic rocks of St. David's, Pembrokeshire. Sir A. Geikie (*q.v.*) regarded the Dimetian granite as having been intruded into the surrounding tuffs in Cambrian, or even later times. Later workers consider both to represent a huge pre-Cambrian volcano.

**Dimidiation** (late Lat. *dimidiatio*, halving). In heraldry, dimidating is a method of marshalling two or more coats of arms on one shield. Instead of duplicating the two entire coats and arranging them quarterly, or impaling them by placing them side by side, only

half of each coat is impaled. This gave rise to such curious compounds as the lion-boat, the fore part of a lion passant whose hind part is an ancient galley, or an eagle-bear. As a dimidiation might be "per pale" (perpendicularly), "per fess" (horizontally), "per bend dexter" (by a diagonal line from right to left), or "per bend sinister" (by a diagonal line from left to right), such extraordinary confusion arose that the method was generally abandoned before the 16th century. See Heraldry.

**Diminished.** In music, an interval which is one semitone less than a minor or a perfect interval. See Diminution; Interval.

**Diminishing Returns.** LAW OF. Generalisation in the enunciation of classical economic theory by Turgot, Adam Smith, Malthus, and Ricardo. It did much to earn for economics the opprobrious term "dismal science." Applied at first to agriculture at a difficult period, it asserted that, after a certain stage of cultivation, an increase in the amounts of labour and capital applied to land will yield a diminishing proportionate return of produce. This is true only when the application is at a given time, to a definite area of land, by the same type and quality of labour and capital, and when the produce is real produce. The law has no significance whatever when applied to money values.

Many writers have applied it to the world as a whole, and used it as an argument against planning an increase in the standard of living of the poorer classes. They assert that this cannot be done, for there is a natural limit in the production of necessities. Raise the standard of living of the masses, they say, and up will go the birth rate, population will outstrip the means of subsistence, and the last state will be worse than the first.

History, through progress in science and technology, supplies an answer to this assumption. For a decade before the First Great War, in a world where profit was very widely regarded as more important than increase of produce, and where restriction of output was a recognized and widespread practice, the rate of increase in the primary products needed by man was more than twenty times that of the increase in population.

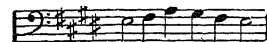
The law of diminishing returns is of value when studying the relative efficiency of different types of organization under given conditions. It may be restated thus:

an increase in one factor of production, applied with a group of other factors, will, up to a certain stage, increase the total, the marginal, and the average product, but after that stage, there will be a more than proportionate decrease.

**Diminution.** In music (1) the presentation of a musical theme in notes of smaller value, thus: Bach Fugue in E.

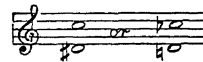


Diminution of the same:



(See Augmentation.) (2) The decreasing of a minor or perfect interval by a semitone, through raising its lower or flattening its upper note: e.g. minor seventh.

Diminished sevenths of this minor seventh:

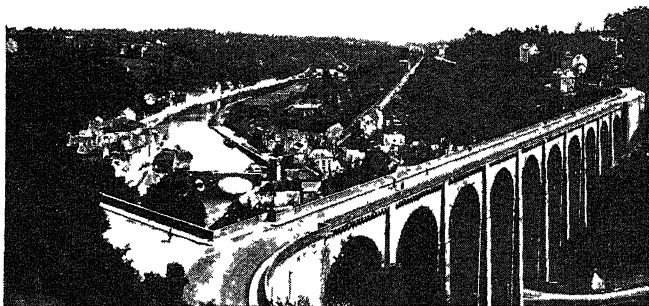


See Interval.

**Dimissory Letters.** Eccles. documents sent by a bishop to take effect outside his diocese. Their common use is for the ordination of candidates by another bishop. N., for example, is to be ordained to a title in Lincoln diocese. But no ordination taking place at that time at Lincoln, N. receives dimissorial letters from the bishop of Lincoln enabling him to be ordained elsewhere.

**Dimitrov, GEORGI** (1882–1949). Bulgarian politician. Born June 18, 1882, at Radoniev, 25 m. S. of Sofia, one of a large family, he became a composer. In 1900 he was made sec. of the Bulgarian printers' union, in 1904 sec. of the trade union federation of Bulgaria; and in 1909 was put on the central committee of the Communist party. Elected to parliament in 1903, he was imprisoned 1917–18 for anti-war activities, and deprived of his seat. He then went to Moscow, and in 1919 became a member of the executive committee of the Comintern. Returning secretly to Bulgaria in 1923, he took part in an abortive plot against the govt., and went once more into exile. Charged with complicity in the Reichstag Fire (*q.v.*), 1933, he ably pleaded his own cause, and was acquitted. In Moscow again, he became a Russian citizen, and was chosen gen. sec. of the Comintern. In 1945 he renounced his Russian citizenship and returned to Bulgaria, becoming prime minister from 1946 until his death, July 2, 1949, during a visit to Moscow.





Dinan, Brittany. View of the town and of the R. Rance, with the impressive Lanvallay viaduct in the foreground

**Dimity** (Gr. *dimitos*, of double thread). Stout cotton cloth with raised patterns, used for bed furniture and hangings. The figures or stripes are raised on one side and depressed on the other, the two surfaces thus showing reversed patterns. The name is also applied to a fine cotton dress fabric, sometimes with a reversible pattern. In 1641 dimity is mentioned as being manufactured of wool in England.

**Dimorphism** (Gr. *di*, double; *morphē*, form). Term applied to the phenomenon of a living organism assuming two different forms. In certain arthropods male and female are so different in form as to appear to belong to different genera (sexual dimorphism). Some butterflies differ in appearance at different seasons, and some of the individual hydroids in a zoological colony look like entirely different animals.

In chemistry, when a chemical compound may crystallise in two distinct forms it is said to be dimorphous; in three, trimorphous; in general, polymorphous. This property is explained by the fact that atoms constituting dimorphic minerals may be arranged in two different crystalline structures, without affecting the chemical composition as a whole.

Examples include calcium carbonate, which crystallises as calcite (rhombohedral, specific gravity 2.7) and aragonite (orthorhombic, specific gravity 2.9); iron tantalite ( $\text{FeTa}_2\text{O}_6$ ) as tantalite and tapiolite; trimorphous titanium oxide ( $\text{TiO}_2$ ) as rutile octahedrite and brookite.

**Dinagat.** One of the Philippine Islands. Lying to the N. of Mindanao, it belongs to the province of Surigao and is about 309 sq. m. in extent. It has a hilly backbone culminating in a peak over 3,000 ft. in height. Rice and other cereals

are cultivated, and fishing is carried on. Dinagat, the chief town, stands on the S.W. coast.

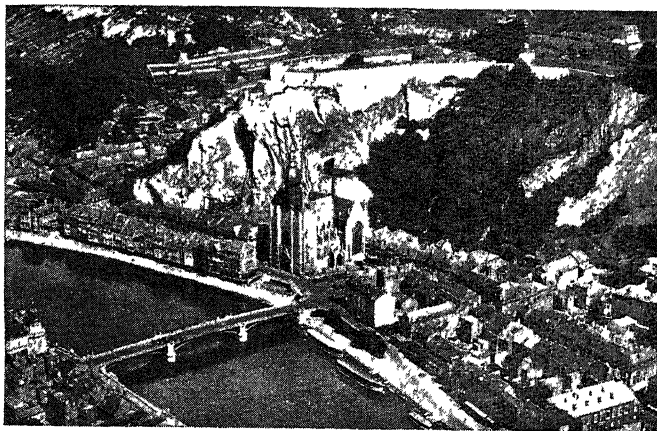
**Dinajpur.** Dist. and town of the former Bengal prov., India. The area of the district is 3,953 sq. m. In 1947 it was split in the partition of the prov. between E. Bengal (Pakistan) and W. Bengal (India). Dinajpur is noted for its archaeological remains, some dating from the 9th cent., while to others tradition gives a much greater antiquity. There are also some 18th cent. temples. The district is unhealthy, with deserted sites overgrown by jungle. A great rice-growing district, it produces rape, mustard, jute, and sugar-cane. Dinajpur town, on the E. bank of the Purnabhaha river, near its confluence with the Dhapa, is in E. Bengal, Pakistan. It is served by rly. Pop. dist., 1,926,833, almost equally Mahomedans and Hindus; town, 19,200, many of them Hindus.

**Dinan.** A town of Brittany, France, in the dept. of Côtes-du-

Nord. It stands on the Rance, 15 m. S. of St. Malo. Mainly on the left bank, it has on the right a suburb, Lanvallay; the river is navigable, and small steamers go to and from St. Malo. Dinan is remarkably picturesque, with town walls partly intact with three gateways; a castle now used as a prison; the cathedral of S. Sauveur, partly Gothic and partly Romanesque (damaged in the Second Great War), and the church of S. Malo; and interesting ruins in the neighbourhood. It has a river harbour. The viaduct over the Rance is notable. The Tour de l'Horloge dates from the 15th century. The town has some small manufactures and a trade in country produce. Barge-building is carried on. In the Middle Ages it was a famous Breton stronghold, and was associated with the exploits of Du Guesclin, whose heart is buried in S. Sauveur. Pop. 12,737.

**Dinant.** Town of Belgium, in the prov. of Namur. It stands on the right bank of the Meuse with the suburb of St. Medard on the left, 17 m. by rly. S. of Namur. The town's interest lies in its church of Notre Dame, a fine piece of Gothic architecture, and its citadel on a towering cliff above. Normally it is a tourist centre, being visited by those who wish to explore the Ardennes or go boating on the Meuse. The name is said to be a corruption of Diana, and a grotto where that goddess was worshipped is still shown.

Dinant had in the 15th century a pop. est. at 60,000; today it has some 7,000. Destruction of its walls and castle by Charles the Bold of Burgundy in 1466 was the beginning of its decay. It belonged then and afterwards to the bishop-



Dinant. Air view of this picturesquely situated Belgian town, showing the Gothic church of Notre Dame and the citadel on the cliff behind



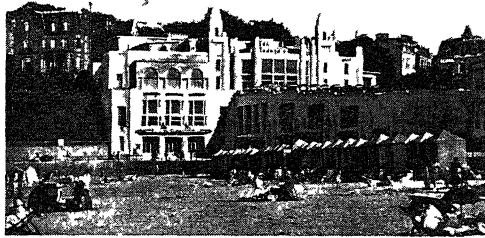
ric of Liège and became Belgian on the foundation of that kingdom in 1830. In 1566 Philip the Good, duke of Burgundy, besieged and captured it, and, taking 800 of the inhabitants, tied them in couples back to back and threw them into the Meuse. On Aug. 15, 1914, in the First Great War, German advance guards captured the citadel and crossed to the left bank of the Meuse, but shortly afterwards had to recross the river when the French counter-attacked. On Aug. 23, Hausen's 3rd German army attacked the French on the W. bank, and falling upon Dinant killed 600 inhabitants and plundered and burnt the town, 1,263 houses being destroyed out of a total of 1,375. This was recorded as one of the worst German atrocities of the war. What was left of Dinant remained in German occupation until the Allied advance through Belgium in 1918.

**Dinapur** OR **DANAPUR**. Town of India. It is in the Patna district W. of that city, in the prov. of Bihar. Its Sepoy garrison started the Mutiny in 1857 for the Patna district. Pop. 31,025, two-thirds Hindus.

**Dinar**. Currency unit of Yugoslavia. The official 1946 exchange rate was 201.5 to the £1. Zinc coins of 5, 2, 1, and  $\frac{1}{2}$  dinar are in circulation, also notes up to 1,000 dinars. The unit is divided into 100 paras.

**Dinarchus** OR **DEINARCHOS** (c. 361–290 B.C.). Last of the so-called "ten" Attic orators. Born at Corinth, he came to Athens at an early age and wrote speeches for others to deliver. Belonging to the pro-Macedonian party, he was an opponent of Demosthenes, whose style he imitated, but with so little success that he was called the "barley Demosthenes." After the death of his protector Antipater he was put to death by order of Polyperchon. Three of his speeches connected with the affair of Harpalus (*q.v.*) are extant.

**Dinard**. Town and watering-place of Brittany, France, in the dept. of Ille-et-Vilaine. It stands on a headland at the mouth of the river Rance, St. Malo being on the other side of the river. Its prosperity depends mainly upon its numerous visitors, many of whom are, in normal times, English or



Dinard. Municipal casino at this favourite holiday resort on the north coast of Brittany

Parisians, and for them there are hotels, casinos, etc. Near is the popular village of S. Enogat. The Germans occupied Dinard during their advance into Brittany on June 19, 1940. U.S. troops were fighting in the town on Aug. 6, 1944, but it was not cleared of Germans until Aug. 15.

**Dinaric Alps** (anc. *Alpes Dinaricae*). Name given to that range of mountains linking the true Alps with the mountains of the Balkan Peninsula. The range, entirely in Yugoslavia, trends S.E. from the Julian Alps, dividing Croatia from Dalmatia, and extends into Bosnia and Herzegovina, forming the watershed between the rivers flowing to the Adriatic and the basin of the Save. Mostly calcareous, with karst characteristics, the mts. attain an alt. of some 6,000 ft., the chief peaks being Mts. Dinara and Orjen. *See Alps*.

**Dinas Rock**. Natural siliceous stone found in the vale of Neath Glam. It contains normally 98 p.c. of silica. Silica being one of the most refractory of natural substances, resisting the highest temperatures occurring in ordinary metallurgical processes, Dinas rock is largely used in making bricks for lining metallurgical furnaces. The rock is ground to a rather coarse sand, mixed with a little clay or lime, and pressed into bricks. While valuable for use in the simpler classes of metallurgical operations, Dinas bricks do not resist the action of metallic oxides, and must always be used with care, as they expand considerably under high temperatures.

**Dindigul** OR **DINDU-KAL** (The Rock of Dindu). Municipality of Madras province, India, in the Madura dist., 880 ft. above sea level. It is commanded by a

wedge-shaped rock, 350 ft. higher, on which stands a fort, 30 m. N.W. of Madura. Dindigul is a position of considerable natural strength, and in the past has been the scene of much fighting. To-day it is a trading centre and rly. junction, noted for tobacco, hides, coffee, and cardamoms. Cheroot making and the manufacture of silk thread are industries. Pop. 49,000, three-quarters Hindus.

**Dindings**. Strip of territory on the S.W. coast of the Malay Peninsula. It is 22 m. long and is included in Perak state. It yields coconuts, coffee, and pepper. The small island of Pangkor (Dinding) is part of the territory.

**Dingelstedt**, **FRANZ**, **BARON VON** (1814–81). German poet. He was born at Halsdorf, Hesse, June 30, 1814, and educated at Marburg. After having taught at Cassel and Fulda, in 1843 he was appointed librarian to the king of Württemberg. He acted as dramatist or director at the court theatres of Stuttgart, Munich, and Weimar, and from 1872 of the Vienna imperial theatre. He died May 15, 1881. He won popularity with his collection of political poems, *Songs of a Cosmopolitan Stargazer*, 1840. Later, with flippant cynicism, Dingelstedt renounced the liberal opinions and feelings by which he had won recognition. He also edited and translated many of Shakespeare's plays.

**Dinghy**. Bengali name for a small rowing boat. These boats are carried mostly by yachts and small vessels, as they are handy and can be dropped or picked up with ease. Collapsible rubber dinghies were carried by military aircraft in the Second Great War. They



Dinghy. Smallest ship's boat, used also for purposes of pleasure

accommodated from two to eight men, and could be inflated in a few seconds. They were equipped with emergency rations and medical supplies and the larger were fitted with a mast and sail. Some types were automatically inflated when they struck the water. *See Boat*.

**Dingle**. District in the city of Liverpool, England. It has a station on the Liverpool overhead rly. At Dingle Point on the Mersey there is a red group-flashing light. *See Liverpool*.

**Dingle**. Seaport, parish, and market town of co. Kerry, Eire. On Dingle Harbour, a N. arm of



1. Iguanodon of Kent and Belgium, 33 ft. long. 2. American triceratops, 25 ft. 3. Stegosaurus of England and America, 30 ft. 4. Brontosaurus, 60 ft. 5. Diplodocus, 84 ft. 6. Megalosaurus of Europe and India, a carnivorous dinosaur, 25 ft.

**DINOSAUR: RECONSTRUCTIONS OF MONSTER PREHISTORIC REPTILES, MADE FROM SURVIVING REMAINS: See page 2718**  
*Specially drawn by J. F. Campbell from material in the Natural History Museum, South Kensington*

Dingle Bay, 30 m. by rly. S.W. of Tralee, it is a centre of the fisheries, engages in mackerel curing, and exports butter. Linen manufacture was an important industry. Market day, Sat. Pop. 1,884.

**Dingle, HERBERT** (b. 1890). British physicist. Born Aug. 2, 1890, he was educated at Plymouth technical school and the Imperial College of Science. He was a member of British government eclipses expeditions, 1927 and 1932; vice-president of the Royal Astronomical Society, 1938-39 and 1942-44; and from 1946 prof. of the history and philosophy of science, University College, London. His publications include *Relativity for All*, 1922; *Through Science to Philosophy*, 1937; and *Sub-Atomic Physics*, 1942.

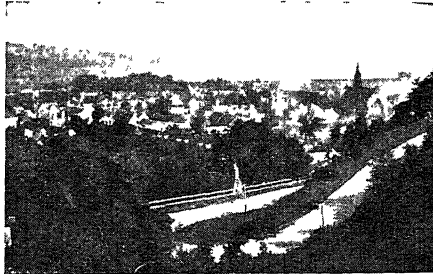
**Dingle Bay.** Inlet of the coast of co. Kerry, Eire. It penetrates 24 m. inland and is 18 m. wide at its entrance, where are Dunmore Head on the N. and Bray Head on the S. The bay harbours are Ventry, Dingle, and Valentia; with Castlemaine, separated from the bay proper by a peninsula called Inch, at the head.

**Dingo** (*Canis dingo*). Wild dog of Australia. It varies in colour from greyish red to black, and is a little smaller than the common wolf, the head being blunter and more dog-like. The tail is usually bushy, the limbs fairly long. It is common in the wooded districts of Australia, is nocturnal and shy, and is rarely found in packs. It makes its home mainly in hollow trees, in which its young, about six or seven in a litter, are born.

The dingo is a great pest to sheep and poultry, and a reward is given by the government for killing it. It is often domesticated by the natives, and freely interbreeds with European dogs. It was no

doubt introduced by man at some remote period, but was an inhabitant of Australia in the Pleistocene period.

**Dingwall.** Royal and police burgh and co. town of Ross and Cromarty, Scotland. It is at the head of Cromarty Firth, 18½ m. by railway N.W. of Inverness. There is some shipping, also an important weekly corn market



Dingwall, Scotland. View of the town from the west, looking towards Cromarty Firth

(Wed.). Of Norse origin, created a royal burgh in 1226, Dingwall has remains of the castle of the earls of Ross, an obelisk commemorating the first earl of Cromarty (d. 1714), a stone circle, and other antiquities. Pop. 2,554.

**Dinitrobenzene** ( $C_6H_4(NO_2)_2$ ). Chemical in long yellowish-white needles. It is prepared by running a mixture of nitric acid and sulphuric acid into nitrobenzene (*q.v.*), contained in a nitrator, the temperature being allowed to rise slowly to 100° C. The dinitrobenzene is purified by washing with water and crystallising from alcohol. The commercial product is a mixture of the three isomeric dinitrobenzenes which can be separated by fractional crystallisation. Dinitrobenzenes are used as intermediate products for organic synthesis.

**Dinitrochlorhydrin.** Viscous liquid with highly explosive properties. Its chemical formula is  $CH_2(ONO_2)-CH(ONO_2)-CH_2Cl$ . It is made by nitrating chlorhydrin with the same mixed acid as is used in preparing nitroglycerine.

Dinitrochlorhydrin has recently found use as an addition to nitroglycerine, since the freezing point of such a mixture is much lower than that of pure nitroglycerine—an important point in the manufacture of industrial explosives. Dinitrochlorhydrin is practically insoluble in acids and water and is not hygroscopic.

**Dinitroglycerine** (Glyceryl dinitrate). Explosive oil used to a certain extent in the explosives

industry, chiefly to render nitroglycerine explosives less liable to freeze. It is rather difficult to manufacture, and is always accompanied by the trinitrate or mononitrate or both. In normal practice the glycerine is allowed to run slowly into 3½ times its weight of nitric acid, the mixture being stirred with compressed air. After 10 hours the dinitroglycerine is separated and washed. Dinitroglycerine is less dangerous to manufacture than nitroglycerine (glyceryl trinitrate), and even if decomposition commences it does not explode. It is a colourless or pale yellow oil, having a density of 1.47 which freezes at about -50° C. One part is soluble in 20 of cold water or 5 of dilute acid, hence the necessity of care in washing. It has a toxic action similar to that of nitroglycerine, whilst it is less sensitive to heat and shock than the latter and possesses about 80 p.c. of its power. It gelatinises nitrocellulose better than does nitroglycerine, with which it is miscible in all proportions.

**Dinitroglycol.** Explosive oil of the formula  $CH_2(ONO_2)-CH_2(ONO_2)$ . Dinitroglycol is a colourless liquid, slightly more viscous than water, having a density of 1.48. It has a rather sweet, disagreeable taste and produces violent headaches. It is slightly soluble in water; very soluble in ether or alcohol.

In explosive properties it is similar to nitroglycerine, but is somewhat more powerful, and has the advantage of not freezing until cooled to about -22° C. It is more easily gelatinised than nitroglycerine by collodion cotton. Its low freezing properties are important, since the addition of 20 p.c. of nitroglycol to nitroglycerine ensures that the explosives in which it is incorporated shall remain unfrozen during winter in Great Britain. By 1932 all nitroglycerine explosives for use in Great Britain were of the low freezing type, and authorisation for use is now limited to this type. In making the non-freeze nitro-product, glycerine is mixed with about 25 p.c. of glycol and the mixture nitrated.

**Dinitrophenol.** An explosive compound prepared from phenol. Its chemical formula is  $C_6H_3(OH)(NO_2)_2$ . It crystallises as pale yellow, right-angled tablets (melting point 114° C.) which are odourless but poisonous. Dinitrophenol is a high explosive of



Dingo, the wild dog of Australia  
Gambier Bolton, F.Z.S.

similar properties to trinitrophenol, but is neither so sensitive nor so powerful. It has not found much use alone, but has been employed as an admixture to trinitrophenol for shell filling. It forms sensitive salts with metals; shells to be loaded with this explosive are first varnished on the inside.

**Dinitrotoluene.** Explosive compound prepared by partially nitrating toluene. It is an important high explosive, and one of the essential intermediate materials of the dyeing industry. It has the chemical composition  $C_7H_5(NO_2)_2$ , and six different isomerides have been prepared, but only three of these occur during direct nitration, under which conditions the meta compound forms the bulk of the product, and this isomeride is the only one of commercial importance. The crude product is a yellow crystalline mass with a melting point of  $66^\circ\text{--}68^\circ\text{C}$ . It is used in many commercial blasting explosives and smokeless powders and is frequently utilised as the starting material for the manufacture of trinitrotoluene. It is not a very satisfactory explosive alone, requiring to be mixed with an oxidiser, when it yields satisfactory products.

**Dinka.** Nilotic negro people, situate mostly in Equatorial and Upper Nile provinces, Sudan. The most powerful tribes breed milch kine; their poorer congeners in the Sudd marches (Moin Tain) live by fishing and hippo hunting. They worship a rain god (Dengdit), and the rainmakers (bain) possess great social power. Ancestral spirits (jok) are propitiated by animal sacrifices. Each tribe has its headman, but there is no national cohesion. See Shilluk.

**Dinmont, DANDIE.** The honest-hearted sheep farmer in Scott's novel, Guy Mannerling, who befriends Harry Bertram. His prototype was James Davidson, a Teviotdale farmer, who reared a variety of terriers known as Dandie Dinmont (*q.v.*).

**Dinosaur** or **DEINOSAUR** (Gr. *deinos*, terrible; *sauros*, lizard). Group of extinct land reptiles living in the Mesozoic era. Mostly of gigantic size with tiny brains, they dominated the world of their time by their bulk. Their skeletal remains are found in every continent, occasionally with impressions of the tuberculated skin, while in the Connecticut valley in N. America they have left a hundred varieties of their footprints.

The dinosauria form four sub-groups: (1) Beast-footed were carnivorous, with sabre-like teeth and hollow bones, mostly walking on the hind limbs. Typical are Megalosaurus and Ceratosaurus, which were surpassed in size by Tyrannosaurus, 39 ft. long, whereas the Bavarian Compsognathus was no larger than a rabbit. (2) Lizard-footed were herbivorous, with solid bones, small heads, long necks and tails, usually walking on all fours. In N. America they attained the largest dimensions of any known quadruped, Atlantosaurus being nearly 100 ft., Diplodocus 84 ft. Brontosaurus and the English Cetiosaurus 60 ft. long. (3) Armoured were herbivorous and walked on all fours. The type genus is Stegosaurus of England and America, in which was developed along the back two rows of bony spines 3 ft. across. The Isle of Wight Polacanthus had



Dinka. Tribesman from the White Nile with elephant-hide shield

a spiny carapace over the hips. The American three-horned Triceratops had a head 6 ft. long, with an enormous bony frill. (4) Bird-footed, also herbivorous, walked on the hind limbs. Typical are Iguanodon of Maidstone and Brussels, 33 ft. long, and the allied Claosaurus of America. See illus. p. 2716.

**Dinothierium** or **DEINOTHERIUM** (Gr. *deinos*, terrible; *thērion*, wild beast). Genus of extinct proboscidean mammals, forming a sub-family of the elephants. Dinothieria apparently originated in early Miocene N. Africa, crossed into Europe, where their fossil skulls are sometimes  $4\frac{1}{2}$  ft. long, and survived into Pliocene times in S. Asia and Greece. They were divergent from mastodons and

elephants in having no upper tusks; the fronts on their lower jaws bore two tusk-like incisors which curved downwards and outwards.

**Dinwiddie, ROBERT** (c. 1693–1770). British colonial governor. Born near Glasgow, he became surveyor-general in the customs service, and in 1751 went to Virginia as lieutenant-governor. He recommended the annexation of the Ohio Valley and the erection of forts on the frontier. In 1753 he sent George Washington to the French forts on the Ohio to demand the withdrawal of French forces from English territory. He was recalled in 1758 after hastening the outbreak of the war against the French and Indians.

**Diocesan Court.** One of the spiritual courts of the Church of England. It is convened for the trial of ecclesiastical causes within a diocese, and presided over by the commissary or chancellor of the bishop. See Ecclesiastical Law.

**Diocese** (Gr. *dioklēsia*, administration). Territorial area over which a bishop exercises jurisdiction and pastoral care. In early times the practice appears to have been to appoint a bishop for each town with the rural area around it. There were 42 bishops in the Roman province of proconsular Asia, an area about the size of Lincolnshire, and 470 in the province of N. Africa. The primitive diocese was thus about the size of a modern rural deanery.

The term diocese is derived from the civil organization of the Roman Empire. Constantine increased Diocletian's subdivision of the empire to over twelve dioceses. Each was further divided into provinces. The Church was reorganized at the same time to follow roughly these imperial boundaries. Over the diocese was a patriarch or exarch who supervised the metropolitans or archbishops of the provinces into which the dioceses were cut up. These last had their seats in the chief towns of the provinces. In turn the archbishops supervised the bishops of all the urban and rural areas.

In the ecclesiastical organization of the Empire the terms diocese and province became in time transferred, with the result that an archbishop administered a province, and a bishop a diocese.

In Western Europe, save S. Italy, dioceses were larger than in Asia Minor or N. Africa, because the towns were fewer, as in the rural areas of the East. They decreased in size and proportion





to the larger number of towns in any given area; they were more numerous in Roman Gaul than in Spain, and in later centuries in Normandy than in Germany or Scandinavia.

In England the development of diocesan organization took a different course. The English dioceses in Saxon times were roughly continuous with the old Saxon kingdoms, and although their number had increased to about a dozen at the time of the Norman Conquest, their area remained large down to the 19th century. After 1066 one new English diocese was created (Carlisle) and four others (Ely, Lincoln, Norwich, and Salisbury) were reconstituted out of older Saxon sees, and were given new cathedral centres. No other new dioceses were created until the Reformation, when Henry VIII set up those of Bristol, Chester, Gloucester, Oxford, Peterborough.

Until the 19th century the number of English dioceses (including four Welsh) was 27, of which 22 were in the province of Canterbury, and five in that of York. In Victoria's reign eight new dioceses were created, and in the 20th century a further twelve; but the four Welsh sees, increased to six, became a new province under the archbishop of Wales. There are now 29 dioceses in Canterbury and 14 in York.

The modern English diocese follows roughly the county area, save around great cities like London, Manchester, and Liverpool, and wherever the population is dense, as in Lancashire and Yorkshire. The diocese has two to four archdeacons. The archdeaconry is subdivided into rural deaneries, which consist of about 10-25 parishes.

A diocesan conference is held annually, sometimes twice a year, to sanction and discuss finance and the spiritual and moral welfare of the diocese. It elects or nominates committees responsible for the administration of the several branches of diocesan activity. Members of the conference are elected by the clergy and laity of the rural deaneries.

The Episcopal Church in Scotland has also a diocesan organization (seven sees). The R.C. Church in England has been administered in modern times by diocesan bishops since 1850 (since the 17th century it had been under the jurisdiction of Vicars Apostolic, bishops without full diocesan powers who ruled over districts).

England and Wales now have 18 sees, four of which are archiepiscopal. Scotland has had its dioceses since 1878, and now has six sees, two of which are archiepiscopal.

**Diocletian** OR GAIUS AURELIUS VALERIUS DIOCLETIANUS (A.D. 245-313). Roman Emperor, 284-305.



Diocletian.  
Roman emperor  
Capitol Museum, Rome

Born in Dioclea in Dalmatia of humble parentage, he entered the army, where he had a distinguished career. On the death of Numerianus, he was proclaimed emperor by his soldiers. Owing to the continued pressure of barbarians on the frontiers of the empire, Diocletian thought it wise to appoint Maximian as a colleague, assigning to him the W. portion of the empire (286). This arrangement was followed by a further division in 292, when Constantius Chlorus and Galerius were appointed Caesars. Diocletian's capital was Nicomedia in Bithynia.

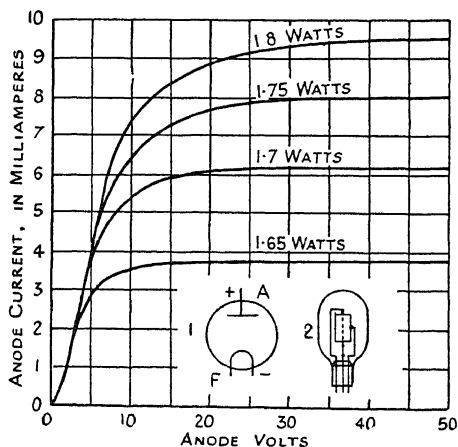
The period of his reign was marked by many successes. Britain was regained for the empire in 296, disturbances in Egypt were quelled with great severity, while the Persians and other barbarians were kept well outside its frontiers. The latter years of the reign of Diocletian were marked by a cruel persecution of the Christians. He abdicated on May 1, 305, and retired to his villa at Salona (Split) in Dalmatia, where he died.

Under Diocletian the empire became in form what virtually it had long been in fact—an absolute monarchy. An Eastern system of etiquette and ceremonial was introduced at the court, and the emperor had to be addressed as *dominus* or lord. Diocletian was an able administrator. His system of decentralisation did much to postpone the disruption of the decaying empire. The motive for his policy of multiplying the administrative divisions of the empire, which he carried out to a very minute degree,

was to reduce to a minimum the power of the holders of offices. To this end also he divorced the military from the civil command. For the adequate defence of the empire he created a powerful force which could be sent at a moment's notice to a threatened quarter. He was less successful in his policy of currency reform, while his attempt to fix maximum prices for commodities in his edict *De Pretiis Rerum Venalium* (On the Prices of Things for Sale) was an absolute failure. Consult *The Persecution of Diocletian*, A. J. Mason, 1876.

**Diode.** An electron tube or valve with two electrodes. The simplest form of valve, it was the original thermionic device produced by Fleming in 1904 after observations on the behaviour of carbon-filament lamps. The arrangement of its parts is shown symbolically, also a typical design, in the figure; while the curves indicate the current passing between its electrodes for varying voltages at four different filament-heats expressed in watts. The cathode may be indirectly heated, consisting then of a thin rod wound with an insulated heater coil.

The diode valve is essentially a rectifier and the direct equivalent of the mechanical non-return valve with adjustable lift. Its action is based upon the emission of electrons from the hot cathode at a rate depending on the temperature. When a voltage is applied between the electrodes in the right direction to give cathode and anode their correct polarities (— and + respectively), the electrons are impelled towards the "plate" and constitute an electric current; there is no flow at all



Diode. Characteristics of diode valve with tungsten filament at various filament wattages. Inset: 1, arrangement, and 2, design of valve

when the opposite polarity is applied. The curves show that the supply of electrons is limited, the current reaching a maximum for each rate of heating, i.e. the valve becomes "saturated." Advantage is taken of this effect by using a saturated diode as a constant-current device. It is chiefly used to rectify the A.C. mains voltage for power-supply units of radio sets, etc.

**Diogenes** (Gr., sprung from Zeus). Common personal name in ancient Greece. *Pron.* Die-oi-eneez.

**Diogenes of Apollonia** (5th century B.C.). Greek philosopher. A native of Apollonia in Crete, he was the author of a work *On Nature*, in which, like Anaximenes (*q.v.*), he maintained that air was the universal primitive matter. All things are simply alterations of air, the result of condensation and rarefaction. According to Diogenes, air was a living, creative, and thinking substance.

**Diogenes of Babylon** (2nd century B.C.). Stoic philosopher. A native of Seleucia, near the Tigris, he succeeded Zeno as head of the school. He is noteworthy as one of the three philosophers sent by the Athenians to Rome, 156 B.C., to apologise for their treatment of Oropus (*q.v.*).

**Diogenes, CALLED THE CYNIC** (c. 412-323 B.C.). Born at Sinôpe on the Euxine, he accompanied his father to Athens and became a pupil of Antisthenes (*q.v.*). He carried the teaching of his master to extremes, went about slovenly and untidy, half-dressed and half-starved, and lived in a tub, or more probably a tiny mud-hut jokingly called a tub by the Athenians. During a voyage to Aegina he was captured by pirates and taken to Crete, where he was bought as a slave by a rich Corinthian. The rest of his life was spent partly in Athens and partly in Corinth, where he died. At Corinth he met Alexander the Great, who, being requested by Diogenes to get out of the way of the sunshine, made the well-known remark, "If I were not Alexander, I would be Diogenes." Nicknamed Socrates gone mad by Plato, Diogenes, who took no interest in political or social questions, left no writings, but is the subject of numerous anecdotes and the reputed author of numerous sarcastic and witty sayings.

**Diogenes Laërtius** (3rd century A.D.). Greek writer. Born at Laertê in Cilicia, he settled in Athens, where he wrote an account of The Lives, Opinions, and Sayings of Famous Philosophers in 10 books. Although inaccurate and uncritical, it is in many respects



Diogenes. From the painting by J. Jordaens, a 17th century Dutch artist, depicting Diogenes the Cynic, lantern in hand, passing through the market place seeking among the crowd for an honest man

an important contribution to the history of ancient philosophy, and is especially valuable for the fragments of authors, whose main work is lost, preserved in it.

**Diognetus**, EPISTLE TO. Christian writing in Greek first printed in 1592 by the 2nd Henri Estienne and ascribed by him to Justin Martyr. Later William Cureton discovered and published with Eng. trans. in his *Spicilegium Syriacum* (1855) a Syriac writing from a MS. of the 6th or 7th century which proved to be almost identical with the Greek. [This is ascribed to "Ambrose a chief man of Greece, who became a Christian, and all his fellow-senators raised a clamour against him, and he fled from them and wrote and showed them all their folly," and it has been suggested that this was perhaps the Ambrose who is represented by a Syriac tradition as the third primate of Edessa and the East.]

**Diomede**. Group of islands in Bering Strait, midway between Alaska and Siberia. They consist of Krusenstern, Ratmanov, and Fairway Rock, and are inhabited by some four-score Eskimos.



Diomedes, from a bust by Polykleitos  
Louvre Museum

between them runs the border line separating Asia from America.

**Diomedes** OR **DIOMEDE**. In Greek mythology, king of Argos, one of the most conspicuous Greek heroes in the Trojan war. During the war he was under the special protection of the goddess Athena, with whose aid he inflicted wounds even on the deities Ares and Aphroditê. Along with Odysseus, Diomedes entered Troy in disguise, and carried off the sacred *palladium*, robbed of which the city was doomed to be taken. He is said to have died at Daunia in Apulia.

Another Diomedes, the reputed son of Arês, was king of the Bistones in Thrace, who possessed a herd of horses which fed on human flesh. He was killed by Hercules, and thrown to his own horses to be devoured. *Pron.* Di-om-ee-deez.

**Dion of SYRACUSE** (c. 408-353 B.C.). Relative of Dionysius the elder and Platonic philosopher. At the beginning of the reign of Dionysius the younger, Dion, assisted by Plato, endeavoured to convert the tyrant to more enlightened ideas, but Dionysius soon tired of philosophy, and Dion was banished in 366. He returned, however, in 357, succeeded in driving out Dionysius, and made himself master of Syracuse. His own rule, however, failed to realize the hopes of the Syracusans. His severity made him unpopular, and he was assassinated.

**Dion Cassius** OR **CASSIUS DIO(N) COCCELIANTUS** (c. A.D. 150-235). Greek historian. Born at Nicaea in Bithynia, of senatorial family, he held several offices under Commodus and later emperors, being twice consul. On his retirement from public life in 229 he returned to his native place, where he died. He was engaged for 22 years in writing his *Roman History* in 80 books from prehistoric times to the reign of Alexander Severus. Dion Cassius displays little appreciation of political history or democratic sympathies, but



is chiefly interested in military matters and court histories. His superstitious nature is obvious throughout the work. His chief models are Polybius, Thucydides, and in his somewhat tedious speeches the classical orators.

**Dion Chrysostom** (d. A.D. 117). Greek rhetorician, a native of Prusa in Bithynia. He spent much of his life at Rome, where he was held in high esteem by the emperors Nerva and Trajan. Eighty of his speeches and essays on miscellaneous political and moral subjects and pretended letters from distinguished personalities are extant. His eloquence gained him the epithet of Chrysostomus 'golden-mouthed'.

**Dione.** In Greek mythology, wife of Zeus and mother of Aphrodite. She was variously called the daughter of Oceanus and Tethys, or Uranus and Ge. At Dodona she took the place of Hera as the wife of Zeus, but when the oracle there became superseded by others Dione sank into insignificance.

**Dionne.** Name of five sisters, world-famous quintuplets (q.v.).

**Dionysia.** In ancient Greece, festivals held in honour of Dionysus or Bacchus (q.v.). The chief festivals were those held in Attica, the Greater Dionysia held at the beginning of spring, and the Lesser in December. The main feature of the former was a procession bearing the image of the god from Lenaeum to the Acropolis and back again. The festival symbolised the reappearance or coming to life of nature in the spring after its disappearance or death during the winter months. The dithyrambs sung in connexion with the festival originally had as their theme the adventures of the god Dionysus in his progress through the world, and were the germ of the drama. *See* Drama.

**Dionysius THE ELDER** (430–367 B.C.). Tyrant of Syracuse. At first a clerk, he afterwards joined the army, and so distinguished himself in the war against Carthage that in 405 he was made commander-in-chief of the Syracusan forces. Having surrounded himself with a bodyguard of 1,000 mercenaries and fortified the island of Ortygia for himself, he made himself absolute ruler of Syracuse, and before long had extended his rule to other cities of Sicily.

In 397 Dionysius reopened hostilities with the Carthaginians, which lasted until 392, afterwards forcing cities of Magna Graecia in S. Italy to acknowledge his authority. In his later years he was a prey to suspicion, and stories are told of his precautions to defeat possible attempts on his life. He would

never be shaved by a barber—using red-hot walnut shells for the purpose; he had everyone searched who came to see him, and flung harmless citizens into prison. The Syracusans were also ground down by excessive taxation. Though oppressive and cruel, Dionysius was a notable patron of art and literature; he beautified Syracuse with many fine buildings, and the philosopher Plato was for a time resident at his court. Dionysius was himself a poet, and one of his tragedies obtained first prize in the competition at Athens which was held 367 B.C.

**Dionysius THE YOUNGER.** Tyrant of Syracuse, 367–343 B.C. The first ten years of his reign were chiefly taken up with a struggle for mastery with Dion (q.v.), and in 356 he retired to Locri. In 346 he returned to Syracuse, which during his absence had been the prey of various military adventurers, and was able to re-establish himself as tyrant. The second tenure of Dionysius at Syracuse lasted only three years, when he was driven out by Timoleon, who had been sent from the mother-city of Corinth in response to an appeal from the democratic party among the Syracusans. Dionysius retired to Corinth (343) as a private citizen, being reduced to keeping a school and giving lectures in singing as a means of livelihood.

**Dionysius THE AREOPAGITE.** A convert of S. Paul when he preached at Athens (Acts xvii, 34). He is said to have become the first bishop of Athens, and to have been martyred there under Diocletian. Other legends confuse him with S. Denis, patron saint of France, and say that he suffered at Montmartre. The philosophical writings which bear his name are probably a 5th century production.

**Dionysius OF HALICARNASSUS** (d. c. 8 B.C.). Greek rhetorician and historian. He came to Rome about 30 B.C. and lived there until his death, teaching rhetoric and perfecting himself in the Latin language. His chief work was *Roman Antiquities*, in 20 books, a history of the Italian peoples from mythical times to the beginning of the Punic wars (264 B.C.). Of these 11 books are extant, going down to the period of the decemvirs (441 B.C.). The object of the work is to flatter both the Romans and Greeks, the former as the conquerors of the Greeks, the latter as the ancestors of their conquerors. In spite of inaccuracies it is an important authority on the history of early Roman institutions. Dionysius also wrote several rhetorical and literary treatises, among

them an *Art of Rhetoric*, and criticisms of ancient poets, historians, and orators (Homer, Thucydides, Demosthenes, Dinarchus), which exhibit far higher critical faculties than his history.

Other Greek literary figures named Dionysius are: D. Periégētēs (guide), of uncertain nationality, who perhaps lived during the reign of Hadrian. He wrote in Greek a description of the world as known in his time. It was much used by later writers, and was translated into Latin by Priscian the grammarian, D. Thrax or the Thracian (c. 120 B.C.). A pupil of Aristarchus (q.v.), he taught in the island of Rhodes and was the author of the first Greek grammar. Written for the use of schools, it is still extant in an interpolated form. It treats of the eight parts of speech and inflexions, but not of syntax.



Dionysus. Bust of the Greek god in the National Museum, Naples

**Dionysus.** In Greek mythology, alternative name for Bacchus, the god of wine. *See* Bacchus.

**Diophantus** (4th century A.D.). Greek mathematician of Alexandria. He is considered the inventor of syncopated algebra, and he wrote an essay on polygonal numbers; but his chief work is his *Arithmetica*, in 13 books, of which six are extant, an algebraical treatise which had much influence on the Arabian school, and indirectly upon the development of European mathematics.

**Diopside** (Gr. *diopsis*, a view through). Rock-forming mineral; a member of the monoclinic pyroxene group, composed of metasilicate of calcium and magnesium, with small amounts of iron replacing some magnesium. It commonly occurs as white to greenish prismatic crystals or granules in igneous rocks and metamorphic rocks such as altered impure limestones.

**Dioptase.** A comparatively rare copper mineral found associated with copper ores in a few localities, *e.g.* Kirghiz Steppes, Congo, S.W. Africa, Chile. Composed of orthosilicate of copper ( $H_2CuSiO_4$ ), it is commonly found in emerald green six-sided prismatic crystals. Fine stones are sometimes used as gems.

**Diopter.** Form of theodolite, now obsolete, for measuring angles. The term is, however, most often used alternatively with dioptrix as a unit for expressing the refractive powers of lenses.

**Dioptrix.** Science of refracted light, though the term is little used now. A dioptrix is more often used to signify a unit of refractive power in terms of focal length. The numerical measure of the power of a lens expressed in dioptrix (or diopters) is the ratio of one metre to the focal length in metres of the lens. *See* Optics.

**Diorite.** Family of crystalline-granular rocks of igneous origin. Composed of plagioclase and iron-magnesia minerals—usually hornblende, which causes their prevailing dark-green colour—and of coarse or medium texture, they differ from granite in having no mica and little or no quartz. Axes of diorite are found in the Swiss lake-dwellings and elsewhere in neolithic Europe. It was quarried in early Egypt for vases and statues, the most famous being those of Khafra, found near his Gizeh pyramid. Imported diorite was used in early Mesopotamia for the Sumerian statues of Gudea of Lagash, and for the Babylonian Hammurabi Code.

**Dioscoreaceae.** Family of twining shrubs and herbs, chiefly natives of the tropics, belonging to the yam family. Most of the species produce tubers, known as yams, many of them useful as food when cooked, owing to the large quantity of starch they contain. The flowers are bell- or funnel-shaped, small, and inconspicuous. Black bryony (*Tamus communis*) is the best known British member. The name is taken from the Greek physician and botanist Dioscorides. *See* Elephant's-foot; Yam.

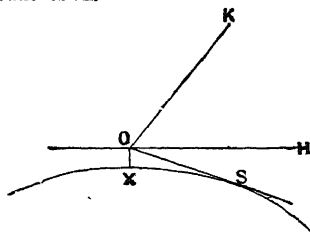
**Dioscorides, PEDACIUS, OR PEDANIUS.** Greek physician. A native of Cilicia in Asia Minor, he lived during the reign of Nero, 1st century. He was the author of a *Materia Medica*, in five books, which was long regarded as a standard pharmacopoeia. Other works on antidotes and drugs attributed to him are probably by a Dioscorides of Alexandria of later date.

**Dioscuri** (Gr. *Dios kouroi*, sons of Zeus). In Gr. mythology, name given to the heroes Castor and Pollux. *See* Castor and Pollux.

**Dip.** Inclination of the earth's magnetic field from the horizontal. The magnetic needle is never exactly horizontal except at the Equator. At the north or south magnetic poles it points vertically downwards, the north-pointing end of the needle dipping vertically downwards at the magnetic north. The extent of the dip from the horizontal is roughly dependent on latitude. But at any place it undergoes variation from year to year, the dip increasing over a period of years to a maximum and then falling again. *See* Needle; Poles.

**Dip.** Term used in navigation to signify the correction to be made in the measurements of angular altitude of celestial objects in order to allow for the height of the observer above the earth's surface. The observer measures the angle of elevation above the visible horizon; this measurement exceeds the true altitude by the dip, or angular depression of the line to the sea horizon below the horizontal plane of the observer.

For the observer at O, O H is horizontal, O S is the line to the horizon, O K the line to the object. Angle K O S is measured, angle H O S is the dip, angle K O H is the correct angular altitude of K.



**Dip.** Diagram showing in exaggerated form effect of dip. *See* text

If O X, the height of the observer, is  $h$  feet, then it may be calculated that the dip,  $d$ , measured in minutes of arc, is equal to  $1.06 \sqrt{h}$ , *i.e.*, if  $h$  is 25 feet the dip is  $0^\circ 5.3'$ , or  $5' 18''$ ; if  $h$  is 100 ft. the dip is  $10' 36''$ . For approximate purposes the dip in minutes of arc may be taken as the square root of the height of the observer expressed in feet. The dip in minutes of arc is roughly equal to the distance of the horizon from the observer in sea or geographical miles, so that from the top of a cliff 256 ft. high the sea horizon is nearly 17 m. away.

**Dip.** In geology, the angle of inclination of a stratum or bed

with the horizontal. It is normal to the strike, which is the direction of a horizontal line drawn on the plane of the bed. Dip used in the same sense is also applied to the inclination of other geological features, *e.g.* dykes, faults.

Dip-slope is the hill-slope which is controlled by the inclination of the beds. It is usually the more gentle slope of an escarpment of which the scarp slope is the line of outcrop of the edges of the inclined beds.

**Dip-circle.** Instrument used for measuring magnetic dip. A thin magnet pivoted at the centre rotates about a horizontal axis. The inclination of the magnet to the horizontal is read on a graduated vertical scale.

**Diphenyl.** In organic chemistry, an aromatic hydrocarbon consisting of two phenyl groups united ( $C_6H_5C_6H_5$ ). Berthelot's method of preparing diphenyl is to pass the vapour of benzene through a red-hot tube. Diphenyl is a white solid insoluble in water. By heating it with chromic anhydride and acetic acid, benzoic acid is obtained as the oxidation product.

**Diphenylamine.** Basic amino derivative of formula  $(C_6H_5)_2NH$  discovered by A. W. Hoffmann in 1864. It is made by heating aniline with aniline-hydrochloride in an autoclave at  $210^\circ$  to  $240^\circ$  C., after which the product is first treated with hydrochloric acid and then with an excess of water, whereby the first formed diphenylamine hydrochloride is decomposed and the free base floats as a thick oil. After washing and separation it is rectified by fractional distillation. Diphenylamine forms colourless crystals which melt at  $54^\circ$  and boil at  $302^\circ$  C. Insoluble in water, but soluble in alcohol, it is used in the dyeing industry, as a stabiliser for smokeless powders, and is the basis of the high explosive hexanitrodiphenylamine (*q.v.*).

**Diphtheria** (Gr. *diphthera*, leather). Acute disease, characterised by the formation of a fibrinous exudate or membrane, most often in the throat, larynx, or nose. The membrane can also occur on the surface of a wound. The micro-organism is the Klebs-Loeffler bacillus named after its two discoverers.

Diphtheria may occur in infants, but is most frequent between the ages of 2 and 6 years, few cases occurring after adolescence. It is highly contagious, and infection is by direct or indirect contact. It is seldom airborne, even over a short

distance. The organisms reside in the secretion of the nose and throat, and are conveyed by kissing or sneezing, or on drinking glasses or handkerchiefs. The germ may live in the throats of the healthy, who act as carriers. All catarrhal conditions of the throat predispose to attack. A swab should be taken, and a culture grown therefrom, whenever a sore throat shows a suspicious exudate; should diphtheria be present, the Klebs-Loeffler bacillus can then be seen under the microscope.

The period of incubation is 2-7 days, the early signs being those of fever with headache and pain in the back and limbs. The throat becomes red and sore, and in a day or two there is a greyish-white membrane at the back of the throat or tonsils or in the nose. The glands in the neck swell.

The disease may present itself in malignant form with severe prostration and gangrene of the tissues of the nose and throat, a form often fatal. In membranous croup or laryngeal diphtheria, the membrane is developed within the larynx or wind-pipe, resulting in difficult breathing. Intubation is the immediate life-saving treatment.

Paralysis of the muscles of swallowing and of other muscles is a recognized complication, as is circulatory failure. These are toxic manifestations due to absorption of the virulent poison manufactured by the bacilli at the site of the membrane and carried off by the neighbouring lymphatics. These complications are insidious and treacherous; therefore all sufferers from diphtheria must have prolonged rest in bed. The essential treatment is early administration of antitoxin, which has much reduced the death rate. Antitoxin should not be used as a prophylactic for contacts, but given immediately the condition is diagnosed.

The Schick test shows whether an individual is susceptible to diphtheria. If a local inflammatory reaction follows the injection of a minute quantity of diphtheria toxin into the skin, susceptibility is indicated and immunising doses can be given. The widespread use of this procedure has greatly reduced deaths among children from this disease.

Hilary Ledgerwood, M.B.

**Diphthong** (Gr. *diphthoggos*, with double sound). Combination of two unlike vowel-sounds, coalescing into one syllable (house, oil). As a rule more stress is laid

upon the first vowel. The two frequently melt into one sound (pain, height). These two kinds of diphthongs are distinguished as proper and improper.

**Diplodocus** (Gr. *diploos*, double; *dokos*, bar). Genus of extinct gigantic N. American land reptiles. They were herbivorous, lizard-footed dinosaurs, living in Colorado and Wyoming in Jurassic times. They were unarmoured, long-necked, long-tailed, and walked on all fours. Their diminutive heads had the nostrils on the top, showing that they spent much time under water, browsing on aquatic weeds. The chevrons protecting the blood-vessels beneath the tailbones were formed of two separate bars slung in the middle, whence the generic name. See *Dinosaur*, illus. p. 2716.

**Diploid**. Term used in cytology to express the condition in a nucleus where the chromosomes are present in duplicate. The condition arises in sexual reproduction with the fusion of pairs of gametes (sex cells), each of whose monoploid nuclei contributes to the diploid nucleus of the first cell of the new organism one of each pair of its chromosomes. Such pairs of chromosomes are often recognizable during the

nuclear divisions occurring while the organism is growing by their similarity in size and shape, and are said to be homologous because it is believed that they perform similar rôles in its life. Particular pairs of chromosomes transmit contrasting, allelomorphic pairs of characters. Each chromosome contains a determinant (*q.v.*) for each of a number of characters; its fellow may contain the same kind of determinant for any particular character, or one for the contrasting character. The diploid condition persists until meiosis (*q.v.*) occurs.

**Diploma** (Gr. *diploos*, double). Term used for a certificate or other mark of efficiency, akin to a degree. Diplomas are given by institutions not of university rank, and also by universities in subjects in which they are not entitled to give degrees. The word means double, and originated in the fact that in Roman times earlier documents conferring certain privileges were written on two tablets of wax, which were then folded or doubled. The word was used in the Middle Ages for various official documents making grants of land, etc., and many collections of these have been made. See *Degree*.

## DIPLOMACY AND DIPLOMATISTS

Sir Charles Petrie, Bt., author of *Diplomatic History 1713-1933*

*An account of the growth and practice of diplomacy provides a useful general background to the many articles in this Encyclopedia on the great treaties of history and the biographies of notable ambassadors, foreign ministers, and other diplomatists. See also International Law*

Diplomacy is defined in the Oxford English Dictionary as "the management of international relations by negotiation." The word is derived from the Greek *diploma* which, among its meanings, has that of a letter of privilege. Diplomacy has existed in some form since the earliest days of civilization. During the past 150 years diplomacy has tended to become a profession, for which special training is necessary, though it is still common for diplomatic missions to be entrusted to politicians and others who are not diplomatists by career.

In medieval times diplomatists were often ecclesiastics because they were by far the best educated people; the Papacy itself early established an efficient diplomatic service. Nevertheless, the resident ambassador or minister was unknown until a much later date, and the diplomatist of the Middle Ages was usually an envoy sent by one monarch to another to discuss

some specific point such as a peace treaty, a frontier dispute, or a matrimonial alliance.

One of the first lay states to establish a permanent diplomatic service was Venice; she was represented by a resident ambassador in most of the leading capitals of Europe after 1500. It is in no way surprising that she should have taken the lead in this respect, for Venice was above everything a commercial power, and as such required early and accurate information about the intentions of other states. The reports of her envoys throw much light upon the 16th and 17th cents.

With the establishment of strong national monarchies in England, France, and Spain in the 16th century, the resident envoy became the rule, though he was still far from being a professional diplomatist. Usually he was a great noble who could afford to pay for the privilege, for his official remuneration was infinitesimal

and often he received nothing at all. With the growing intercommunication between states more was required of him; the negotiation of such general settlements as the treaty of Westphalia (1648) and the treaty of Utrecht (1713) called for qualifications of no mean order.

During this period first Spanish, and then French, diplomacy was pre-eminent, and the dominant position of Louis XIV in Europe was in no small measure due to his intimate acquaintance with what was taking place in foreign countries. As a rule, he did not employ members of the high aristocracy on diplomatic missions, but preferred men of the middle class such as he used in the administration of France herself.

The treaty of Vienna (1815), like that of Versailles (1919), was negotiated by a conference attended in person by the leading statesmen of Europe; but the 19th century as a whole witnessed the triumph of the professional diplomatist, and was, indeed, his heyday. Nevertheless, diplomacy underwent a great change during this period owing to improvements in means of communication and to the growth of democratic systems of government.

#### Functions of Diplomacy

The business of a diplomatist is not to initiate policy, but rather to negotiate along lines laid down for him by his government. Before the coming of the telegraph it was often necessary to leave him considerable latitude owing to the slowness of communication. Lord Stratford de Redcliffe, British ambassador in Constantinople, precipitated the Crimean War (1854) largely on his own initiative. The telegraph, and still more the telephone, drastically curtailed the freedom of action of the diplomatist, while the aeroplane has enabled the politician to become highly mobile, and so has further limited the function of the professional diplomatist.

The advent of democratic forms of government meant that ambassadors became the representatives of nations rather than of monarchs, which increased their responsibility. The public opinion of the country to which they are accredited has always to be taken carefully into account; and it is easier to make a mistake in dealing with millions of people than with a few individuals. There is now far more publicity for diplomatic activities, and since the First Great War there has been

an unparalleled interest in international affairs. Economic and financial problems, too, became of ever-increasing importance, and the development of wireless has not been without influence. All these changes have necessarily imposed fresh burdens upon the shoulders of the diplomatist.

Partly in consequence of this there has been a tendency, at any rate on the part of the British government, to revert from time to time to the earlier practice of appointing non-professional men to some of the big diplomatic posts: notable examples were the sending of Lord Derby to Paris, Lord Halifax to Washington, and Sir Samuel Hoare (Lord Templewood) to Madrid.

#### Ambassadors and Ministers

Of late the distinction between an ambassador and a minister has almost ceased to exist. Originally only the Great Powers were represented by an ambassador, and he had the right to demand an audience of the monarch to whom he was accredited, whereas a minister had to deal with the appropriate member of the government concerned. Even relatively insignificant powers now have ambassadors, and between them and ministers is a distinction without a difference.

In 1945 reforms were introduced into the British diplomatic service, which has since been known as the British foreign service. Previously the consular and diplomatic services were distinct; the former dealt with commercial matters, and the rule was once a consul (*q.v.*) always a consul. Now the services have been amalgamated, and all diplomatists will spend some of their time as consuls. This system had previously been adopted by other countries.

In a British embassy of the first rank there are, in addition to the ambassador, (1) the councillor, who acts as *chargé d'affaires* when the ambassador is away or the post is vacant, and at other times is second in command of the embassy; (2) the first secretary, chief assistant of the councillor; (3) the second, third, etc., secretaries (of whom there may be four or five); (4) the honorary attachés; (5) specialists in such matters as trade unions and agriculture.

It is usual for an entrant into the foreign service to spend a year or two at the foreign office learning the work before he is posted to a British embassy or legation abroad, and at different stages of his career he will be recalled to the foreign office for a spell.

From the beginning diplomatists have been accorded the immunities which earlier attached to heralds. In no circumstances can a diplomatic envoy be tried or punished for a criminal offence by the state to which he is accredited; generally speaking, he cannot be sued for debt or summoned as a witness.

His official correspondence, both postal and telegraphic, is privileged against censorship or any kind of interference, while his official residence is exempt from visit and search by the police.

On the other hand he is expected to conform voluntarily to local rules and regulations; he must not identify himself with any political party, and he must not overstep the rather uncertain boundary line which separates the duty of collecting information from the offence of espionage; or, perhaps, it would be more correct to say that he must not allow himself to be found out. If he misconducts himself his government will be asked to recall him, while in extreme cases he may even be put under arrest and expelled.

In totalitarian states, or when ideological differences, whether religious or political, are strong, difficulties are likely to arise. During the wars of religion in the 16th century the ordinary resident ambassador was often little better than a chartered spy, and many diplomatists were active conspirators. In modern times the totalitarian countries have frequently abused diplomatic privilege in the same way. But the diplomatist can do much to remove that uncertainty and suspicion which more than anything else leads to international friction.

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**Diplomacy.** Drama adapted by B. C. Stephenson and Clement Scott from Victorien Sardou's *Dora*. It was produced by the Bancrofts, Jan. 12, 1878, at the Prince of Wales's Theatre, London, where it ran for 329 performances. Notable revivals included those

by the Bancrofts at the Haymarket, 1884; John Hare at the Garrick, 1893; Gerald du Maurier at Wyndham's, 1913 (a freely modernised version); Gladys Cooper at the Adelphi, 1924. A burlesque, *Dora and Diplunacy*, by F. C. Burnand, was produced at the Strand Theatre, 1878.

**Diploma Gallery.** Home of the examples of work which artists, on becoming R.A., are required to present to the Academy within six months of their election. The rule governing the custom was passed in 1770; but as the Academy had been founded two years earlier, the first 36 members were exempt from the operation of the law. Most of them have since been represented by pictures, etc., purchased by the council or otherwise acquired. The exhibits now number about 300, and the collection is housed in the Diploma Gallery (which also contains works of foreign masters) at the Royal Academy, Burlington House, London.

**Diplomatic** (Gr. *diploma*, folded paper.). Word used for the critical study of documents, especially historical, to be carefully distinguished from diplomacy. The critical examination of the actual historical documents, charters, treaties, etc., was first called diplomatic (*res diplomatica*) in France in the 17th century, doubtless because some of the documents were known as diplomas. The study was taken up at various seats of learning as history became more scientific. Diplomatic is concerned solely with the genuineness or otherwise of the documents, and arose at a time when forgeries of ancient charters, etc., were plentiful and undetected. It has nothing to do with the truth or otherwise of the facts contained in them, nor does it seek to decipher them, that being the province of palaeography. There is a lecturer in diplomatic at Oxford. See History; Manuscripts; Palaeography.

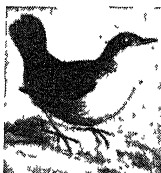
**Diplomatic Corps.** Term applied to the general body of ambassadors and diplomatic agents accredited to a government. They enjoy special privileges, e.g. freedom from arrest, and when these are attacked they act in concert. Ministers rank according to seniority. The diplomatic corps accredited to the court of St. James's is under the supervision of a marshal, assisted by a vice-marshal and an assistant marshal. See Diplomacy.

**Diplomatic Service.** This body was amalgamated with others in

1943 to form the new foreign service of the British government. See Foreign Service, British.

**Dipnoi** (Gr., double breathing). Term applied to the lung fishes, which have developed the power of breathing air with a simple lung as well as extracting air from the water by gills. There are three existing genera: the Australian *Ceratodus*, the African *Protopterus*, and the S. American *Lepidosiren*.

**Dipper** (*Cinclus*). Name sometimes applied to the water ouzel. The bird is common in England, where it is often seen about the streams, feeding on aquatic insects. It is brown in colour, with white underparts, and can walk under water by gripping the stones



Dipper or water ouzel

with its feet. At any greater depth than that just sufficient to cover its head the bird uses its wings in the effort to keep below water. Its nest is made of grass, skilfully concealed by a covering of moss.

**Dipsacaceae.** Family of perennial or biennial herbs. Belonging to the teasel family, they have opposite leaves, and small, funnel-shaped flowers gathered into a hemispheric or cylindric head. Well-known examples are the teasel (*Dipsacus sylvestris*) and the scabious (*Scabiosa*).

**Dip-Sector.** Sector between the true and the real horizon at sea. At sea the altitudes of celestial objects are measured from the visible sea horizon. This is below the true horizon by an amount depending on the elevation of the observer's eye above the surface of the sea. See Dip; Navigation.

**Dipsomania.** Paroxysmal drinking to excess of alcohol; really a form of manic depressive psychosis. It manifests itself in attacks of great alcoholic excess with no intake of alcohol between the attacks. It is not induced by any previous taking of alcohol. Treatment lies in the province of psychology, but rest and skilful nursing are necessary. Apomorphine has been found helpful.

**Diptera** (Gk. *dis*, two; *pteron*, a wing). Order of insects comprising the two-winged or true flies. Only fore-wings are present, the hind-wings being modified into a pair of minute knobbed organs, or *halteres*, of sensory function. Over 85,000 species are known, more than 5,000 in Britain. See Fly.

**Dipterocarpaceae** (Gr. *dipteros*, double-winged; *karpos*, fruit). Family of large trees yielding resinous balsamic juice. They are natives of the tropics of the Old World. They have alternate leaves, and often fragrant flowers disposed in flat-topped clusters. The fruits are leathery with winged appendages, and containing a single seed. The juices of the trunk are used as pitch, varnish, and medicine. One species (*Dryobalanops*) furnishes Borneo camphor. *Vateria indica* yields the pinaceous dammar, used for varnish.

**Diptych** (Gr. *diptychos*, folded in two). Hinged, two-leaved tablet of wood, metal, or ivory. Folded together like a book, with its inner surfaces coated with wax, it was used by the Greeks and Romans for writing on with a *stilus*, a small iron rod, pointed at one end and blunt at the other (for smoothing the wax when correction was necessary), that did duty as a pen. Later, the diptych was adopted by artists, the tablets



Diptych in ivory, showing The Virgin and Child and Christ blessing. Early 14th century; 8½ inches high  
Victoria and Albert Museum

being replaced by panels on which were painted pictures mostly of a religious character. See Triptych.

**Dir.** Territory of the North-West Frontier Prov., Pakistan. The nawab of Dir is the overlord of the territory. Wherever possible cultivation is carried on, and the soil yields rich crops. The region is mountainous, and is drained by the Panjkora and its tributaries. Timber is exported down the rivers. Area about 3,000 sq. m. Pop. approx. 119,000.

**Dirac**, PAUL ADRIEN MAURICE (b. 1902). British physicist. Born Aug. 8, 1902, he was educated at Bristol university and St. John's College, Cambridge. In 1932

he became Lucasian professor at Cambridge, and the following year was awarded the Nobel prize for physics. In 1939 he received the Royal Society's medal for development of new quantum mechanics. His *Principles of Quantum Mechanics* revolutionised the approach to the subject. *See* Quantum Theory.

**Dirae.** In classical mythology, one of the names under which the Eumenides (*q.v.*) were known to the Romans.

**Dircē** (Gr. *Dirkē*). In Greek mythology, wife of Lycus, king of Thebes. For her cruel persecution of Lycus's former wife, Antiope, the children of the latter, Amphion (*q.v.*) and Zethus, when they reached manhood, besieged Thebes, killed Lycus, and tied Dircē to a bull. *Pron.* Dir-see.

**Direct Action.** Term used by the French syndicalists to imply that the industrial strike is preferable to the slower constitutional method of obtaining change through political action at the polls and in parliament. Direct action was favoured by a section of the British trade unions in 1918, but in 1920 an overwhelming majority of the Trades Union Congress (*q.v.*) rejected it in favour of constitutional methods. Later that year, however, a council of action was set up to employ direct action to influence the British government's policy towards Bolshevik Russia. In May, 1926, the T.U.C. called a general strike in an effort to compel the government to intervene in favour of the miners. This was unsuccessful, and direct action of this type was made illegal by the Trade Disputes and Trade Unions Act, 1927, repealed 1946. *See* Trade Disputes Acts.

**Direction Finding.** Application of radio communication to the determination of the position of a ship or aircraft relative to one or more known points. Various systems are all based upon two fundamental principles: (1) radio waves travel through space with the same velocity as light waves; (2) maximum signal voltage is generated in a vertical loop or frame aerial when the plane of the aerial is parallel to the direction of travel of the radio waves, and zero voltage is generated when the plane of the aerial is at right angles to the path of the radio waves. In its simplest form a direction finder consists of a receiving set connected to a frame aerial capable of rotation about a vertical axis. Transmitting stations, or radio

beacons, send out a given signal at regular intervals on a specific wavelength.

Rotation of the frame aerial of the receiving set to a position of either maximum or minimum signal strength gives the direction of the transmitters. The rate of change of signal strength with rotation being much greater at the minimum position than at the maximum, the setting for minimum signal strength is invariably used in practical D.F. navigation. When the position of minimum intensity is found, the plane of the aerial is in line with the direction of the transmitting station. By linking the frame aerial with a scale marked off in degrees, to read zero when the plane of the aerial is at right angles to the geographical meridian, the minimum position provides a direct indication of the bearings of the transmitting station. When the bearings of two or more transmitting stations have been plotted on a chart, the position of the direction finder can be established relative to the known positions of the transmitting stations. The latest types of D.F. installation provide bearing determinations to an accuracy of less than one degree.

Direction finding apparatus may be fitted with the cathode ray oscillograph to give direct and visual readings on a fluorescent screen when atmospheric electricity renders sound signals inaudible. *See also* Radar.

**Directoire Style.** Simplified form of decoration which preceded the empire style in France. It marked a reaction in taste from the 18th century modes. The name was used when France was under the Directory (*q.v.*).

**Director** (Lat. *dirigere*, to direct). One who holds a governing administrative position. In English company law the word has a special meaning. A director is appointed under the articles of association to manage the affairs of a company. The directors must act as a body, and the decision of the majority is final. Their powers to act for the company are set out under its articles. Usually, although it is not legally necessary, they must have a certain financial qualification, and are liable for gross negligence in the discharge of their duties and for breach of trust.

**Directorium** or **ORDO.** Latin name for a calendar issued annually by the bishops of the R. C. Church to their clergy. Printed in Latin, it contains the

necessary information for the daily services of the Mass and the Breviary. In the early Middle Ages few rubrics were written down, and instructions for the order of service were in the main oral. By the 11th century a written ordinal of Sarum (Salisbury) came into use in England, and from the ordinal came the directorium or pye (*pica sarum*), as it was called in England before the Reformation. As the breviary then consisted of four separate books, some guide as to its use was necessary. The general directorium for the Church of England is contained in the various tables and instructions at the beginning of the Book of Common Prayer. *See* Calendar.

**Director of Public Prosecutions.** British official, appointed by the home secretary. It is his duty, under the attorney-general, to institute criminal proceedings and assist the police in conducting them. The great majority of public prosecutions are begun by the police, but the director must prosecute where the offence is punishable by death, or where he is ordered to do so by the attorney-general or home secretary.

**Directory, THE** (Fr. *Le Directoire*). Committee of five who governed France from 1795 to 1799. In 1795 it was resolved to frame a new constitution, and this provided for a legislative assembly of two houses, and for the actual work of government by five directors. They were chosen by the council of ancients, the upper house of the assembly, from a list of 50 persons elected by the 500 members of the lower house. One was to retire each year. The National Convention was dissolved and the five chosen. The first five were Rewbell, Barras, La Revellière-Lépeaux, Carnot, and Letourneur. They divided the various departments between them, their headquarters being in the Luxembourg. The establishment of the Directory aroused opposition, which was crushed by Bonaparte. The new government created a slight feeling of security, while its credit was enhanced by military successes, due in part to Carnot's organizing genius. But differences soon appeared among the directors, and on Sept. 4, 1797, Rewbell and two acting with him managed, by a *coup d'état*, to get rid of Carnot and Barthélemy, his sole supporter among the five, who had taken the place of the retiring Letourneur. The legislative assembly did as the three directors wished, and a new reign of terror began. Mean-

while, the financial position grew worse. and in 1799 France met with reverses in the field. The Directory was clearly dying, and Sieyès, one of the five, was planning to overthrow the constitution of 1795. Under these conditions Bonaparte arrived in France, and by the *coup d'état* of 18 Brumaire (Nov. 9, 1799) put an end to the Directory. See French Revolution.

**Directory.** Guide to the inhabitants of a town or district, giving addresses and occupations; list of members of trades or professions; or telegraphic or cable addresses. The first London Directory was printed for Sam Lee and sold at his shop in Lombard Street, near Pope's-head Alley, and Dan Major at the Flying Horse in Fleet Street, 1677. "A Collection of the Names of the Merchants living in and about the city of London . . . carefully collected for the benefit of all dealers which shall have occasion with any of them." The Post Office London Directory, so called since 1819, grew out of The New Annual Directory, 1800.

**Directrix.** In conic sections, a fixed line used in the definition of the ellipse, parabola, and hyperbola. These conic sections may be defined as the locus of a point whose distances from a fixed point and a fixed line are in constant ratio. The fixed line is the directrix, the fixed point a focus. See Conic Sections; Focus.

**Dire Dawa.** Town of Abyssinia. It is 25 m. N.W. of Harrar, and is connected by rly. with the port of Jibuti in French Somaliland on the Red Sea. In the Second Great War it was captured from the Italians by a S. African force on March 29, 1941. Pop. 30,000.

**Dirge.** Song, chant, or piece of music expressive of mourning. The word is a contraction of the Lat. *dirige*, first word in the Roman Catholic Office for the Dead, from the Vulgate version of Psalm 5, 8. From this it has come to mean such expressions of grief for the dead as the coronach of the Scottish Highlands or the keening of an Irish wake.

**Dirigible.** Term applied to any aerial vessel capable of being steered. It was originally employed to distinguish from the ordinary balloon the lighter-than-air vessel which on being fitted with motive power of its own acquired dirigibility. See Aeronautics; Airship.

**Dirk** (17th. cent. dork; perhaps from Du. *dolk*). A form of short



Dirk. Highlander's dirk and sheath

dagger or poniard worn by Scottish Highlanders. Its triangular blade is sharply pointed, and its length varies from 12 to 20 ins. It is also the side-arm of a midshipman in the British navy. See Dagger.

**Dirk Hartog.** Island off W. coast of Australia, the most westerly point. Its length is 40 m. and its breadth 10 m. Near it to the N. are the islands Doré and Bernier, the former a sheep station, the latter an isolation hospital for aborigines.

**Dirt Track Racing.** Name by which speedway racing was first known. See Speedway Racing.

**Dis.** In Greek mythology, alternative name for Hades or Pluto, the ruling deity of the underworld.

**Disability.** The state of being unable to perform an action. There are physical disabilities, e.g. the inability to see or hear; and legal disabilities, i.e. disabilities imposed on certain classes of persons by law and custom. Minors, for instance, are prevented by law from entering into contracts except for necessities; women in some countries still, as in the past in the U.K., are not allowed to vote or to serve on public bodies; and lunatics are not permitted to manage their own business affairs.

**Disabled Person.** Man or woman incapacitated in small or great degree by physical disability. The Disabled Persons (Employment) Act, 1944, gave to all such persons the right to government assistance in training to overcome their disability, where this is serious, and in finding employment. It set up a register of such persons, registration not, however, being compulsory; and it compelled employers of 20 or more employees to include a quota (which varies from time to time and is fixed by the minister of Labour) of registered disabled persons among them.

**Disarmament Conference.** International conference convened at Geneva on Feb. 2, 1932, with a view to reducing world armaments. The preamble to part V of the treaty of Versailles had envisaged general disarmament, and Act 8 of the League Covenant declared that the maintenance of peace required the reduction of national armaments to the lowest point consistent with national safety. In 1930 a League commission put forward a draft convention, which however, ignored such essential points as the number of trained

reserves permissible to any nation, and the application of science and industry to the production of war materials.

An obstacle to general agreement was that the draft convention provided for Germany remaining at the level of disarmament imposed on her at Versailles. When the conference met, under the presidency of Arthur Henderson (Great Britain), it took an unharmonious course. France was solely concerned with her own security; Germany harped on the question of equality; Russia advocated measures far too radical for general acceptance. The conference adjourned for three months; when it resumed in Dec., Germany's demand for equality was recognized, and a draft convention was presented by Ramsay MacDonald providing for substantial disarmament over eight years. This plan was unanimously adopted on June 8, 1933, but in Oct. Germany withdrew from the conference and the League of Nations, and the conference adjourned indefinitely.

**Disbar.** In England, the process of unmaking a barrister. A barrister can only be disbarred by the benchers of the Inn of Court to which he belongs. See Barrister.

**Discharge.** Cancellation of the contract of enlistment (*q.v.*). A certificate is sent to the soldier on which is shown the cause of discharge. A soldier who leaves the colours and takes up civil employment is not necessarily discharged—he may have been transferred to the army reserve following the termination of the colour service for which he was contracted. A soldier who has served 12 years is time-expired and entitled to a free discharge, provided that he has not re-engaged to complete 21 years; except that during a state of emergency such service may be prolonged by an Act of parliament, or when serving overseas under peace-time conditions he may be held for a year.

In peace-time a regular soldier may purchase his discharge after a specified time, or take it with pension after 18 years' service. Soldiers no longer fit for service are discharged and if their disability is accepted as attributable to, or aggravated by, their military service, they are eligible for a disability award. Men discharged on account of physical disability due to military service during the First and Second Great Wars were eligible for a silver badge. See Badge illust.



**Discharge.** In English law, the final step in the release of a bankrupt from his liabilities. After the conclusion of his public examination a bankrupt may apply for his discharge to the judge, who may grant it at once; grant it after a certain period or subject to certain conditions, *e.g.* the payment of a certain dividend; or refuse it. The judge must take into account the report of the official receiver on the case. The court cannot grant an unconditional discharge where the bankrupt has committed an offence in which certain facts are proved—*e.g.* assets are under 10s. in the £ of his liabilities. *See* Bankruptcy.

**Discharge.** For this term in electricity, *see* Electric Discharge.

**Discharge Tube.** Vessel containing a rarefied gas through which an electric discharge (*q.v.*) is caused to pass. Its object is often to give light, as in neon or fluorescent lamps, or to generate cathode rays or electrons or X-rays. The chief forms of discharge tubes are illustrated in the article on Electronics.

1. *Elementary Discharge Tube.* When the initial researches into the conduction of electricity through rarefied gases were being carried out, a plain glass tube about 1 to 3 ft. long was used, with a side connexion for attaching the exhaust pump, and disk-ended electrodes fused through the ends. Small ornamental tubes are also made, permanently evacuated and containing various residual gases, for scientific display purposes; they are known as Geissler tubes.

2. *Crookes Tube.* Permanently evacuated form of (1), resembling an electric filament lamp in shape, for demonstrating the properties of cathode rays.

3. *X-Ray Tube.* By causing the cathode ray beam to strike a metallic target, X-rays are generated at the point of impact.

4. *Cathode Ray Tube.* The original Crookes tube generated cathode rays, and present-day cathode ray oscillographs are a specialised form. Large metal oscillographs and electron microscopes have a discharge tube at the upper end for creating the beam.

5. *Valve.* Thermionic valves and photo-electric cells are also specialised forms of discharge tubes, but are usually classed as electron tubes.

6. *Neon Lamps.* Small discharge tubes containing two closely spaced electrodes and a residual filling of neon are used on D.C. and A.C. supply systems at

200 volts or over. They give a weak orange red light and are chiefly used for signalling.

7. *Long Discharge Lamp.* The mercury arc lamp is a high power discharge tube now used mostly for photography. The Moore tube, which reached a length of 180 ft., was used as a lamp about 1908.

8. *Fluorescent Lamp.* The plain discharge lamp was improved by the utilisation of the ultra-violet rays in the discharge, which add to the illumination by causing special powders coating the inside of the tube to fluoresce in various colours. This development was then carried on to the production of the fluorescent lamp, which gives a near approximation to daylight. *See* Electronics.

**Disciple** (Lat. *discere*, to learn). One who professes to be learning or to have learned something from another and maintains what he has learned on the authority of his teacher. In this sense the word is applied to the immediate followers of Jesus Christ. After the Ascension it was used of all who professed belief in Christ's teaching. The word occurs once in the O.T. (Isaiah 8), and is of frequent occurrence in the N.T., in which it is applied to Moses (John 9); followers of John the Baptist (Matt. 9); and followers of the Pharisees (Matt. 22). *See* Apostle; Jesus Christ.

**Disciplina Arcani** (Lat., discipline of the secret). Term applied to the practice in the early Church of reserving to the baptized and to communicants instruction and participation in the more solemn rites of the Christian religion. This secrecy concerned the sacraments, the doctrine of the Trinity, the Creed, the Lord's Prayer, and ordination. It was maintained in intercourse with unbelievers.

Based, it is thought, on Matt. 7, v. 6; 1 Cor. 3, vv. 1-2; Heb. 5, vv. 12-14, and influenced by fear of profanation and persecution, by the desire to secure fitness of candidates for the church membership by gradual initiation, and by the example of the pagan Mysteries, it was observed between the 2nd and 6th centuries. To it is

partly attributable pagan hostility and the symbolical and enigmatic language of early Christian writers. *Consult* The Ariens of the Fourth Century, J. H. Newman, 1833.

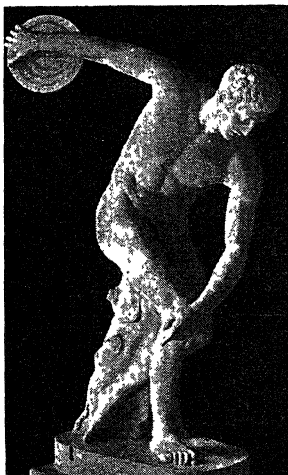
**Discipline** (Lat. *disciplina*, instruction, training). Implicit obedience to certain rules of conduct which is exacted from soldiers, pupils, and others. Soldiers are trained by a process of drill to obey orders without thought of consequences. Thus they can be relied upon to carry out unpleasant or dangerous duties without hesitation, and to live in strict accordance with regulations for the general good. Neglect of regulations is a breach of discipline, and is punished under disciplinary codes such as the Army Act and the King's Regulations. Wilful infractions of these codes are regarded as insubordinate behaviour, although among civilians they might amount to no more than the exercise of personal liberty. The opposite is true of disciplinary developments in schools, where the tendency towards freedom and self-discipline has become general.

**Disclaimer.** In English law, a renunciation or denial. A person nominated in a will as executor may disclaim before probate. A trustee in bankruptcy may disclaim an onerous property—*e.g.* a lease—on paying compensation. During the Second Great War a tenant of land which suffered war damage could end his tenancy by giving a notice of disclaimer.

**Disco** or **Disko.** Island off the W. coast of Greenland, N. of Davis Strait and separated from the mainland by Waigat Strait. It has an elevation of 2,500-3,000 ft., and

possesses stone-quarries, lignite coal mines, iron, and valuable fisheries. The harbour and town of Godhavn lies on the S. coast. Area, 3,200 sq. m.

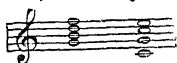
**Discobolus** (Gr. *diskos*, quoit; *bolos*, thrower). Name of the famous bronze statue by Myron (*q.v.*), representing an athlete in the act of "throwing a discus." The British Museum (Towneley Marbles) has a copy of the original, and there is another in the Vatican.



Discobolus. Vatican copy of the bronze statue by Myron

**Discomycetes** (Gr. *diskos*, disk; *mykēlēs*, fungi). Fungi of the family Ascomycetes. The spore-bearing organ is typically a disk, mostly with upturned edges, more or less fleshy, and usually brightly coloured. The cells (asci) containing the microscopic spores are immersed in the substance of the disk, and open on its upper surface. In *Helvella* and *Morchella* (Morels) the disk form is departed from, the spore-bearing tissue being spread over a stalked conical or rounded head.

**Discord.** In music, a combination of two or more notes which requires a following combination, called its *resolution*, to satisfy the ear; e.g.



See Concord; Harmony; Interval.

**Discount** (Lat. *dis*, off, away; Fr. *compter*, to count). Financial term, strictly meaning an allowance made when a bill or debt of any kind is paid before it is really due. It is chiefly used in connexion with bills of exchange, the discount on which is calculated according to the state of the money market. For instance, a banker might give 95 for a bill of exchange for £100, due twelve months from date. This is rather more than 5 p.c.: if he charged discount only at the rate of 5 p.c. he would pay £95 4s. 9½d. for the bill, a year's interest on which is £4 15s. 2½d.

In a looser sense discount means the amount allowed off the prices that buyers pay for goods. In the wholesale trades most manufacturers and merchants sell subject to discounts of varying rates. One advantage of this method is that it enables retail prices to be fixed with ease. For instance, a manufacturer advertises an article at a certain price which is the price of sale everywhere. The retailer obtains his profit because he buys subject to a considerable discount, usually something like 33½ p.c. The word is also used for the amount by which any investment or security is less than its face value. For instance, if Consols are at £90 they are at a discount of 10, and if £100 of stock is offered to the public for less than £100 it is said to be offered at a discount. In this sense discount is the opposite to premium. See Bill of Exchange; Compound Interest.

**Discovery.** English legal term. In a legal action a party is entitled, subject to certain restrictions, before trial, to make the other party state in writing and on oath what documents relating to the matters

in question he has or has had available or in his possession. He may also, by leave of the court, put written questions to the other party, to be answered in writing and on oath, called interrogatories, to compel him to discover facts material to the points at issue.

**Discovery.** British ship. There have been several ships of that name used for Polar exploration. The first, commanded by William Baffin, made six voyages to Arctic regions between 1602-16. The second voyaged to Hudson's Bay in 1719. The third took part in Capt. Cook's third voyage; in the fourth Vancouver found the land named after him. The fifth was commanded by Capt. H. F. Stephenson during the Franklin Relief Expedition of 1875.

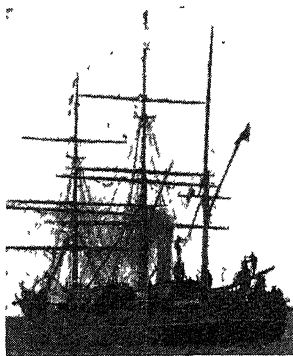
The sixth carried Capt. R. F. Scott's expedition to the Antarctic, 1901-04. She afterwards traded between West India Dock, London, and James Bay, Canada. She was requisitioned by the Admiralty in 1914, and in 1916 went to the aid of the stranded members of the Shackleton Antarctic expedition. In 1923 the *Discovery* was commissioned for a three-year oceanographical and meteorological expedition, and later made surveys of Kerguelen Island. In 1931 she was laid up at East India Dock, London, where she remained until presented in 1938 to the Boy Scouts Association for the use of sea scouts and moored in the Thames off the Victoria Embankment. Constructed of oak and teak, the *Discovery* was launched at Dundee in 1900; she displaces 485 tons on a length of 172 ft. and a beam of 33 ft.

**Discretion.** Term used in English law. A court has sometimes a discretion as to whether it will make an order, e.g. for an injunction, or for costs. In the divorce court a petitioner who has been guilty of adultery must ask for the discretion of the court to be exercised in his or her favour. If full disclosure is made the court usually grants a decree.

**Discursive** (Lat. *discurrere*, to run backwards and forwards). Epithet applied to reasoning which, in order to reach conclusions from

premises, passes from one term to another, comparing them in succession one by one. Discursive knowledge is obtainable by a process of thought, whereas intuitive knowledge is based upon certain fundamental and unquestionable *a priori* principles. The term discursive is also applied to desultory reasoning or conversation which does not keep strictly to the subject in question. See Intuition.

**Discus** (Gr. *diskos*). Round or oval piece of stone or metal. In throwing the discus, which was one of the contests of the Greek Pentathlon (*q.v.*) and is still a favourite pastime in Greece, the competitor who threw farthest was the victor. The sport was revived at the Olympic Games in 1896. The regulation modern discus consists of a circular piece of wood not more



Discovery. Captain Scott's vessel sailing for the Antarctic in 1901  
Eastwood

than 8½ ins. in diameter surrounded by a rim of iron, plates of brass being inserted in the centre to bring the weight up to not less than 4½ lb. The world's record throw of 186 ft. 10½ ins. was made by F. E. Gordian (U.S.A.) in 1949.

**Disease.** Ill health due to a recognizable cause. A localised disease is one which is limited to a definite part of the body, for example, lupus. A constitutional disease is one which affects the whole body, such as scarlet fever. Some diseases, e.g. syphilis, are localised in the early stages and become constitutional later.

An infectious or a contagious disease is due to the action of a micro-organism in the body, or part of the body. An epidemic disease attacks a large number of persons more or less simultaneously. An endemic disease tends to recur in a particular locality. A congenital disease is present at birth and is sometimes, though erroneously, spoken of as inherited. It is due to an infection of the child before birth. It seems probable that a tendency to develop a disease, e.g. diabetes, may be inherited.

**NOTIFICATION OF DISEASES.** When an inmate of any building is suffering from a notifiable disease the local medical officer of health must be notified. This duty falls first on the head of the family,

next on the nearest relatives present, next on anyone in charge of the patient, and finally on the occupier of the building. The doctor attending the patient is also required to notify.

The following are notifiable diseases: smallpox, cholera, diphtheria, membranous croup, erysipelas, scarlet fever, typhus, typhoid, enteric or relapsing fever, plague, cerebro-spinal fever, acute poliomyelitis, acute encephalitis lethargica, acute polioencephalitis, ophthalmia neonatorum, puerperal pyrexia, malaria, dysentery, acute primary and acute influenza pneumonia, and tuberculosis. Local authorities may make any other disease notifiable in their area.

**Diseases of Animals Acts.** British Acts of Parliament, passed 1894 to 1937, provide for the prevention, notification, and treatment of certain diseases of animals. The minister of Agriculture and Fisheries makes orders relating to specific diseases: cattle plague (rinderpest), pleuro-pneumonia of cattle, foot and mouth disease, swine fever, sheep-pox, sheep-scab, and, for certain purposes, glanders, rabies, anthrax, parasitic mange in horses, tuberculosis, epizootic abortion and lymphangitis, and a large number of fowl diseases.

The animals to which the provisions apply are cattle, sheep, goats, swine, and, for some purposes, dogs, cats, horses, poultry, and hens. The minister may extend the provisions to any four-footed animal, any birds, and any disease. The owner of an animal with any of these diseases must inform the proper authority. Infected animals must be isolated, and the movement of animals and holding of markets in any area may be forbidden. The minister may order the slaughter of an infected animal, and of animals that have been exposed to infection; the owner being entitled to compensation.

**Disendowment.** Alienation of church property by the state. In England the claim of the established church is that the word established only implied state recognition of pre-existing rights, and it contends that church property is only national property in the sense in which all property within the state is national property. The liberationist view is that, the church being no longer coextensive with the nation, tithes and lands derived from pre-Reformation endowments should be diverted to strictly national

purposes. By Acts of 1869 (operative 1871) and 1914 (operative 1920) the Irish and Welsh Churches were disendowed as well as disestablished, the clergy in each being given a life interest in their benefices. See Church of England; Disestablishment.

**Disentis** or **Disentis** (anc. *Desertinum*). Village and health resort of Switzerland, in the canton of Grisons. It stands near the confluence of the Vorder with the Mittel Rhine, at an alt. of 3,764 ft., 34 m. W.S.W. of Coire. Its Benedictine abbey, said to have been founded in 614, is the oldest in Switzerland, and was rebuilt after its partial destruction by the French in 1799. Beautiful views of the Rhine valley are gained.

**Disestablishment.** Term used for the separation of church and state. Such separation took effect in France, Dec. 11, 1906. The Irish Church was disestablished and disendowed Jan. 1, 1871, the Act having been passed in 1869. After attempts in 1886, 1892, 1894, 1909, and 1912 to disendow and disestablish the English Church in Wales, an Act was passed in 1914 and came into effect in 1920.

The movement for the disestablishment of the English Church started about 1831. The Society for the Liberation of Religion from State Patronage and Control, known as the Liberation Society (*q.v.*), was founded in 1844, and the Church Defence Institution in 1860. In 1896 the latter became the Church Committee for Church Defence and Church Instruction. Bills to disestablish and disendow the English Church were rejected in 1871 by 374 votes to 89; in 1872 by 295 to 61. Leading members of the English Church have expressed themselves as willing to agree to disestablishment, but regard disendowment as confiscation. They point out that the Free Churches themselves are bound by the doctrinal provisions of their trust deeds. The liberationist argument is that disestablishment must be accompanied by disendowment of all the ancient endowments, which include those of the cathedrals.

**Disease** (Fr. woman speaker). Term now applied to an actress who specialises in monologue as distinct from parts in plays. Yvette Guilbert was the most celebrated of the class. The Americans, Ruth Draper and Cornelia Otis Skinner, are others who have achieved success.

**Disfranchisement.** Depriving persons of the franchise or right to

vote, and also of the right to be separately represented. A parliamentary constituency is said to be disfranchised when it loses the right to send separately a member or members to the house of commons. Under the Reform Act of 1832 no fewer than 56 boroughs were disfranchised, a number of others suffered the same fate under the Act of 1867, and further groups under later Acts of redistribution. The individual voters, however, are not disfranchised, for, given the necessary qualifications, they become voters in the county or other new constituency in which the former constituency is merged. Following corruption at the time of an election, a constituency may be disfranchised for a term of years, and during that period is not represented in the house of commons. Thus, Macclesfield was disfranchised after the general election of 1880, and Northampton was virtually disfranchised after 1880, when Bradlaugh would not take the oath, and the house refused to let him sit unless he did.

The second kind of disfranchisement is taking away the right to vote from individuals. Thus, in 1782, the parliamentary vote was taken away from all those employed in the excise, customs, and post office, and was not restored until 1867. In 1918 those who had been conscientious objectors during the First Great War were deprived of the franchise for a limited period. See Franchise.

**Disinfection** or **STERILISATION**. Term applied to the various processes of destroying those unicellular forms of life known as bacteria, but usually extended to cover the killing of certain protozoa. The term is applied equally to pathogens and non-pathogens. Disinfection is performed either by chemical agents called disinfectants or by physical agents such as light or heat. A disinfectant kills micro-organisms, whereas an antiseptic inhibits their growth and multiplication without necessarily killing them. To be effective, a disinfectant must dissolve in or be miscible with water, for adsorption of toxic substances on to or diffusion of such substances through the external membranes of the bacterial cell occurs only in an aqueous environment.

The correct amount of heat always kills bacteria readily, and on the whole moist heat is more effective than dry. Those bacteria which form spores are much more difficult to kill by any method of disinfection than those which do

not. Most of the human pathogens do not form spores.

Objects which can be made really hot in a flame can readily be freed from living bacteria. Laboratory glass-ware, which when new is often heavily infected with *bacillus subtilis* spores from straw packing, can be sterilised by dry heat in an oven—preferably electric—at a temperature of about 165° C. for an hour. Glass-ware can also be sterilised by steam under pressure in the autoclave; this method is also used for surgical dressings and instruments. Non-absorbent cotton-wool plugs should be used to prevent damping. A pressure of 1 atmosphere corresponding to 120° C., when the autoclave is properly manipulated, will ensure sterility after 10 to 30 minutes.

“Live” steam at 100° C. is not a reliable agent for disinfection as it fails to kill spores in any reasonable time. Immersion in boiling water is safe only if carried out by persons with knowledge and experience of the difficulty and danger involved. Certain media containing heat-coagulable proteins cannot be submitted to a temperature of even 100° C. without damage. They are sterilised by a process known as inspissation: discontinuous heating at 60° C. for an hour on several successive days, followed by slow heating up to 75° C. to coagulate the medium. Goods of rubber should be sterilised in the autoclave. Some liquids can be filtered free from bacteria by means of special filters of porcelain, sintered glass, or collodion. Chemical disinfection is not generally a reliable substitute for disinfection by heat, but often objects are too large or too fragile for heat treatment.

Disinfection of the skin is a difficult problem. Absolute alcohol is not so effective as 75 p.c. alcohol in water, as the former tends to coagulate matter on the bacterial envelope and prevents real penetration and toxic action. Alcohol, in any event, has no residual effect. Swabbing the skin with ether probably has only a local analgesic and cleansing effect. Painting with tincture of iodine is effective and has a residual effect, although it is somewhat destructive to the skin. The method of skin sterilisation consists in working into the skin a dilution of proprietary preparations of para-chlor-meta-xylenol, chlor-chresols, and benzyl cresols. As these substances are relatively non-toxic, non-irritant, and non-volatile solids or viscous liquids,

they possess a marked residual action. Methods of attacking bacteria deep in the body, where they cannot be reached by chemical disinfectants, depend on the use of agents such as sulphanilamide or penicillin, which seem to encourage the anti-bacterial action of the blood although the exact nature of their mechanism is not precisely known.

The efficiency of disinfection is a function of (a) dilution of the disinfectant; (b) the time of disinfection; (c) the temperature of the disinfection. The method of evaluation now almost universally used in the U.K. is the Rideal-Walker test (B.S.I. specification 541/1943). A rough guide is to use a dilution of some 10 to 20 times the stated R.W. coefficient, but for special purposes the directions of reputable manufacturers should be followed. Black and white disinfectants and the lysols are preparations of the higher homologues of phenol of coal tar origin. Hypochlorite preparations are widely sold. For aerial disinfection moist formaldehyde vapour is still used; hypochlorites were used in air raid shelters during the Second Great War in the form of fine mists; aerosols containing hexyl-resorcinols, lactic acid, etc., are also applied.

A. SCIVER, B.Sc., F.R.I.C., F.I.S.E.

**Disintegration.** In nuclear physics, decomposition of a radio-active element, resulting in the formation of a different element. This process may take place naturally or be produced artificially, the result either way being a stable end-product which is non-radio-active. Disintegration thus involves transmutation of one element into another, and several unstable intermediate elements may be formed before the new element of lower atomic mass is obtained.

The process is simple in that as the nuclei of the atoms are left in an excited condition they emit their surplus energy in the form of alpha-, beta- or gamma-particles. When disintegration is produced artificially, as by bombarding an atom with alpha-particles, the emission produced is of positrons, whereas in the natural disintegration of radio-active materials the emission is that of electrons. By natural disintegration radium is converted into lead of much lower atomic weight. Thus the dreams of the medieval alchemists of transmutation of one element into another have been realized by modern science. See Atom.

**Disjunction.** In cytology, separation of the members of the pairs of homologous chromosomes into different nuclei. Disjunction occurs during meiosis. In this process two nuclear divisions result in the division of tetrads of chromatids twice longitudinally so that the four nuclei which are formed each contain one of the chromatids but never both members of each homologous pair. They have disjoined. They may do so at either of the nuclear divisions, and it is not necessary for all pairs in one nucleus to disjoin simultaneously. During synapsis, which precedes disjunction, chromatids may be twisted across one another, forming chiasmata. When disjunction occurs, chromatids may break at a chiasma; the two parts so formed may become attached to corresponding parts of another chromatid which has broken simultaneously. Thus chromatids exchange corresponding lengths and new combination of determinants (*q.v.*) arises. Disjunction is thus the cytological process which “deals out” nuclear substance and with it heritable qualities in fresh combinations.

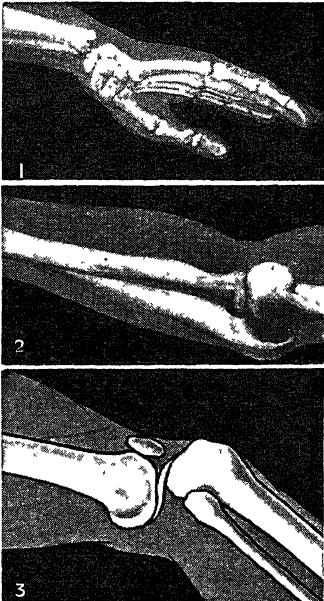
**Disjunctive** (Lat. *disjungere*, to disunite). In logic, a disjunctive judgement is a proposition in which the truth of one of two or more statements is asserted, in which the subject or predicate contains disjunctive ideas: A is either B or C; either A or B is C. In a disjunctive syllogism the major premise is disjunctive: A is either B or C; A is B; therefore, A is not C; A is either B or C; A is not B; therefore A is C. It is also a grammatical term. See Conjunction.

**Disk** or **Disc.** Word meaning a flat plate. It is used in astronomy for the seemingly flat figure of a body in the heavens; in botany for the surface of an organ as opposed to the margin, and in several other senses—with certain flowers, *e.g.* daisies, for the central portion of the head.

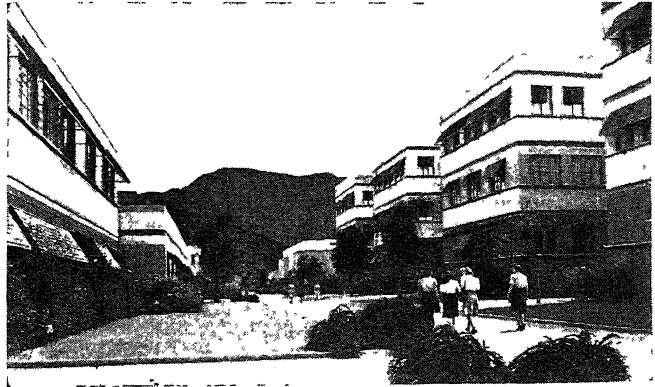
**Dislocation** (late Lat. *dislocare*, to put out of place). Displacement of the head of a bone from its socket in a joint. This is sometimes congenital, *i.e.* present at birth, when the condition is due to some fault in development. The hip is the joint most frequently affected. More often dislocation is due to violence, such as a fall, particularly if a strong muscular effort is made at the moment of injury. When the skin is broken and communication is made with

the external air, the condition is spoken of as compound dislocation, and when associated with fracture of a bone the term fracture-dislocation is employed. The signs of dislocation of a joint are pain, bruising, and swelling, deformity of the limb, and impairment of movement. Cartilages attached to the bones may be torn and muscles injured. Treatment consists in restoring the bone to its normal position by manipulation, with the patient probably under an anaesthetic, followed by a course of massage to remove inflammation, etc. See Massage; Surgery.

**Dismal Swamp.** Morass in the U.S.A. Mainly in Virginia and partly in N. Carolina, it lies well above the surrounding country, and covers an area of about 750 sq. m., to which it has been reduced by drainage. The centre is occupied by Lake Drummond, and most of the remainder is covered with cypress, cedar, other trees, and grass. The swamp formed part of Washington's Virginia estate, and he supervised the first attempt at reclamation. The Dismal Swamp Canal, 22 m. from Albemarle Sound to Chesapeake Bay, is a link in the system of inland waterways from New York to Florida; it enables shipping to avoid Cape Hatteras. Constructed in 1828, the canal was reopened in 1899. The Washington highway also traverses the swamp.



Dislocation. Drawings showing examples of bone displacement. 1. Wrist. 2. Elbow. 3. Knee. 4. Hip



Walt Disney. Part of the vast Disney studios at Hollywood: left, the inking and painting building; right, the animation building

**Disney, WALTER ELIAS** (b. 1901). American film cartoonist. Born at Chicago, Dec. 5, 1901, his father an Irish-Canadian, his mother of German origin, he went to school in Kansas City and attended the Chicago academy of fine arts. Trained as a commercial artist, he went to Hollywood in 1923. In a garage, his first studio, he drew animal cartoons, but after the creation of Mickey Mouse in 1928 the garage became a vast film factory to keep pace with the demand for Disney productions. Soon Disney was employing numerous draughtsmen and controlling his own art studios.

Mickey Mouse, once perhaps the most popular character of the screen, was surpassed by his friends—Donald Duck, the eternal lowbrow, Pluto, the pathetic bloodhound, and Goofy, an in-



Walt Disney. American film cartoonist

determinate creature. In 1932 Disney turned to short films in colour, featuring all these and a host of other characters from nature in his musical Silly Symphonies, of which Three Little Pigs was the most famous. Even these did not supply full scope for his brilliant, witty, and often beautiful technique, and in 1938 appeared his first full-length musical cartoon film, Snow White and the Seven Dwarfs. Ostensibly for children, this was an extension of all that had gone into his earlier work; it was followed by the moral fantasy Pinocchio. In 1942 came Dumbo (the baby elephant) and Bambi (the baby deer); but after America's entry into the Second Great War Disney concentrated mainly on propaganda films and instructional cartoons on entirely new lines for training in the U.S. forces. His most ambitious work was Fantasia (1941), in which he set patterns and stories to eight pieces of classical music played by a symphony orchestra. In Song of the South, 1947, he combined cartoons with living characters. The Reluctant Dragon (1941) showed scenes in the Disney studios and revealed something of his highly organized methods of production.

**Disorderly House.** Habitation which becomes a public nuisance. The keeper of one is liable to imprisonment and fine. Under an English statute passed in 1751 and extant, two ratepayers can compel the local authority to take action by indictment. The measure applies to gaming-houses, places of ill-fame, and other houses where crimes or disturbances of the peace are probable. The machinery for prosecution under this Act is clumsy and costly. Where the dis-

orderly house is a brothel, Criminal Law Amendment Acts of 1885 and later are invoked. These provide summary penalties, increasing in severity after a previous conviction, for keeping or managing such a house or permitting it to be used for the purpose.

**Dispatch** OR **DESPATCH**. Term originally applied to any message conveyed by special messenger to ensure speedy delivery, but now used of official documents generally. It is also specially applied to communications on military and naval matters, in particular to the accounts of actual fighting operations transmitted to his government by the officer commanding the fighting forces. Current accounts of operations are limited to a condensed *résumé* of their general trend in order to baffle the enemy, the detailed accounts usually termed *dispatches* not being as a rule published until some considerable time after the events to which they refer. *Dispatches*, in contradistinction to the daily *communiqués*, deal fully with the tactical as well as the strategic features of the operations, and mention by name the units engaged and the salient features of the duties undertaken by them. Officers and other ranks whose conduct has deserved special mention are also named in *dispatches*.

**Dispatch Rider**. Orderly employed with troops on active service who is specially detailed for the conveyance of orders and messages between headquarters and units, or between one unit and another. In all wars this duty has called for men of exceptional courage, resource, and integrity. Speed being essential, mounted men were usually employed, but towards the end of the 19th century cyclist orderlies were also instituted. At the outbreak of the First Great War numbers of motor cyclists were enrolled as dispatch riders and proved invaluable in maintaining communication between units when the field telephone system broke down. During the Second Great War dispatch riders were essential to the movement of armour and mechanised transport, as they kept the front and rear of columns in touch.

**Dispensary for Sick Animals, PEOPLE'S**. Organization founded in 1917 to promote the alleviation of suffering among animals by treatment. It maintains hospitals and dispensaries in London, the provinces, and in France, Rumania, Tangier, Egypt, Palestine, South Africa, and the Netherlands E. Indies. While an animal is being

treated, its owner is advised as to its care, prosecutions for cruelty being thus reduced in number. Its head office is at 14 Clifford Street, London, W.1. See *Cruelty to Animals*.

**Dispensation** (Lat. *dispensare*, to weigh out, distribute). Term denoting (1) a general scheme or arrangement under which certain definite laws and regulations are appointed to men, as, for example, the Jewish dispensation, the Christian dispensation; (2) a relaxation or suspension of a law granted by competent authority in a particular case, while yet the law remains binding on the general community.

In the Roman Catholic Church the power of dispensation rests on the theory that he who makes the law has the power to suspend it, and that this power is exercised personally or by delegation. Thus, while the Divine law may never be abrogated, the pope claims as teacher to define its limits, and as vicar of Christ to grant dispensations from certain impediments in matrimonial cases, from vows and from orders. By delegation the power of dispensation is vested in certain specially appointed tribunals and congregations, and is further exercised by bishops, vicars-general, and parish priests. The Council of Trent enacted that the payment of money *ipso facto* rendered a dispensation null and void, but in practice certain fees, nominally to cover the expense of the grant of a dispensation, and alms to be devoted to pious purposes, may be imposed.

**Dispensing** (Lat. *dispensare*, to weigh out). The compounding of drugs. In early days the process was crude, minerals and animal substances being generally dispensed by reducing them to fine powder. With vegetable drugs, even in remote times, the dispensing was more elaborate; the herbs were soaked in water with or without the aid of heat and the solution used. For many years dispensing was chiefly confined to vegetable substances. Minerals fell into disuse until later, when the various salts were prepared and then these salts were dispensed. Advances in medicine and science have improved methods of administering medicaments, so that dispensing today demands a knowledge, not only of plant products, but of synthetic chemicals, vaccines, serums, vitamins, animal glands, and the new antibiotic substances, such as penicillin and streptomycin.

In the U.K. a dispenser is one qualified under the Pharmacy Acts to carry on the business of a chemist

and druggist, which includes the dispensing of physicians' prescriptions. The Society of Apothecaries grants a qualification to act as an assistant or dispenser to an apothecary. Public bodies generally require persons holding public appointments in institutions to possess a pharmaceutical qualification. No one may use in business any title, emblem, or description suggesting he has any qualification for selling, dispensing, or compounding drugs or poisons if he has not that qualification. The maximum penalty is a fine of £20 and a further £5 a day if he continues after caution.

The Apothecaries Act (1815) directed the Society of Apothecaries to institute an examination to test the fitness and qualification of those who worked to act as "assistants to apothecaries in compounding and dispensing medicines." The assistant's certificate entitles the holder to dispense medicines in a physician's surgery, public dispensary, or hospital, or in a pharmacy; under the National Health Insurance Act, holders of the certificate can dispense medicines for insured persons under the supervision of a registered pharmacist. But an assistant may not keep a chemist's shop. To do this it is necessary to pass the Chemist and Druggist qualifying examination of the Pharmaceutical Society and to be registered as a chemist and druggist, i.e. a pharmacist. It is also necessary to register the premises at which the business is carried on. Pharmaceutical chemist is a term restricted to those who have passed the higher examination conducted by the Pharmaceutical Society.

#### Weights and Measures

Doctors' prescriptions are usually dispensed by apothecaries' weight, and written in signs, for scruple, drachm, and ounce. On the Continent the metric system of weights and measures is used; and since in 1899 the British Pharmacopoeia—the official volume describing drugs used in medicine—appeared with both metric and apothecaries' weights against each preparation, that publication has also used the metric system in all its descriptions.

To become an assistant in dispensing of the Society of Apothecaries it is necessary to present a certificate in general education (matriculation, including pass in English and arithmetic) or school certificate (with pass in both English language and arithmetic). Candidates must be 18 before they

can enter for the examination and must present evidence of instruction in chemistry and practical pharmacy. The examination is both theoretical (oral) and practical (dispensing).

Many women pass the assistants' examination, while others enter the pharmaceutical profession. Women have opened chemists' shops of their own; others find employment in hospitals, institutions, and pharmacies.

To become a pharmacist, the first step is to pass a recognized examination in general education. The student must then register as an "apprentice or student," and be given one year's full-time instruction at a recognized institution. The intermediate examination is then taken, followed by a further year's full-time study. Before the Chemist and Druggist qualifying examination (the minor) is passed, the student must undergo a practical course of study (apprenticeship) in a shop or approved hospital dispensary or manufacturing pharmaceutical laboratory of at least 4,000 hours. For the Pharmaceutical Chemist diploma (the major) longer full-time instruction is required. Possession of a university degree in pharmacy does not entitle the holder to practise or to registration as a pharmacist.

**Dispensing Power.** In English history, the power claimed by certain kings of allowing an individual to break the law without penalty. It must be distinguished from the suspending power, the suspension of the operation of a general law.

As an outcome of their admitted right of pardoning offenders, the Tudor and Stuart kings before James II often exercised this privilege, and in 1663 Charles II tried, but in vain, to secure the formal consent of parliament to it. Under James II the matter became critical. In 1686, in the case of Sir Edward Hales, the king obtained from a packed bench of judges a decision declaring the dispensing power legal, and proceeded to use it in favour of Roman Catholics, giving them offices from which they were excluded by law. These proceedings aroused great anger and contributed to that discontent among his subjects which led them to drive James from the throne. The declaration in the Bill of Rights that "the pretended power of suspending or dispensing with the law, as assumed of late, is illegal," ended the practice. See Rights, Bill of; Sovereignty.

**Dispersal.** The term used in botany for the scattering of seed. Seed plants normally grow fixed in the soil, from which they draw supplies of water and salts, spreading their leaves in the air to catch the light. Each plant requires for healthy existence a certain minimum living space; it is thus advantageous to a new generation if the seeds from which they are to develop are distributed far from the parent. Colonisation of a fresh habitat results from the dispersal of seeds to a fresh and suitable locality.

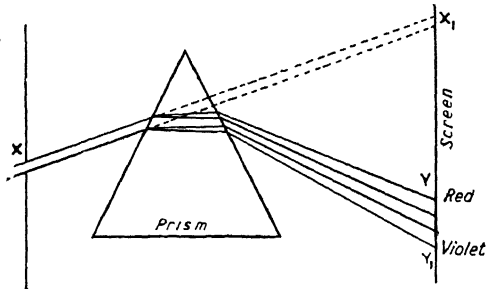
Some plants accomplish dispersal by "explosive mechanisms." As a gorse pod dries, contraction occurs in opposed directions in its two sides and a tension is set up which ultimately causes the two to fly apart with such violence that the seeds are slung away. Similar mechanisms are found in the fruits of the crane's bill, where strips of the bill curl up suddenly; and in the pansy, whose shiny seeds are pinched out from between the sides of the valves of the pod just as wet orange pips may be projected by pressure between finger and thumb. In the squirting cucumber, explosions caused by the sudden relief of sap pressures set up within juicy fruits may shoot the seeds out.

Most plants, however, depend on external agencies for impelling their seed. Poppy capsules sway in the wind until sufficient momentum has been imparted to the loose seeds within for them to be slung out of the pores at the top. Very small seeds, such as are formed by some orchids, blow about as if they were dust. Hairs grow out from the seed coats of willow herb or cotton, or from the pericarps of single seeded fruits, e.g. dandelion, thistle, upon which wind pressure may bear to drive the seeds. A similar effect arises from the outgrowth of the testa, e.g. pine, or the pericarp, e.g. sycamore, to form wings which, delaying the fall of the structure, give it a chance to be caught up by the wind and floated through the air.

Water movement serves many plants which grow in or near it and form buoyant seeds or fruits.

Animal movement helps in two ways. Seeds or structures containing them may have hooks which catch in the fur or feathers of passing animals, the seeds being later brushed off; and fleshy parts may be used as food while the seeds are not consumed. Common examples of the former method are found in cleavers, geum, agrimony, and burdock; and of the latter in the apple, rose, blackberry, and strawberry. Even when the seed is swallowed by an animal, it often passes through the alimentary tract unharmed. The seed envelopes often protect the embryo inside from damage, though they themselves may undergo softening which makes germination easier when the seeds are deposited with the animal's faeces around them to act as manure.

**Dispersion.** Name given to a phenomenon in optics. If a narrow pencil of rays of white light, such as sunlight, is allowed to pass obliquely from one medium into another, as from air into



Dispersion. Diagram illustrating the dispersion of light through a prism. For explanation see text

water, glass, or crystal, it is found that in the second medium the light is spread out into various colours, violet being more deviated than red. This is called dispersion. If a beam of parallel rays of white light is allowed to enter a dark room at X through a narrow slit, it will fall virtually unaltered on a screen at  $X_1$ . When a prism is introduced the pencil of light will be bent towards the base of the prism; but the patch on the screen will no longer be the same size as before; it will be spread out as  $Y Y_1$ , and it will be drawn out into a rainbow band. The white light has been dispersed, and the colours have been spread out because the amount of bending effected by the prism is different for light of different colours. (See Colour col. plate; Refraction.)

Some minerals, when viewed under convergent polarised light,



show characteristic types and degrees of dispersion—an important diagnostic feature in determinative mineralogy.

**Displaced Person.** Any person who, as a result of action by the fascist or Nazi regime, of a regime allied in the Second Great War to one of these, of the Quisling or similar regimes, or of the Falangist regime in Spain, had been deported from or been obliged to leave his land of nationality or former habitual residence. The term came into use as the Allies entered Germany in 1945 and began to overrun camps, underground workshops, and other places where such people were found; it was precisely defined at the first meeting held in London, April 8–June 1, 1946, of the United Nations' Special Committee on Refugees and Displaced Persons. Most displaced persons were nationals from the conquered countries compelled to work for the Germans in Germany. At the end of the war in Europe, Allied military authorities found themselves responsible for care of some 7,500,000 such people, mainly Russians, Poles, French, Dutch, Belgian, and Norwegians. Camps, whose administration was passed by the military to the United Nations Relief and Rehabilitation Administration (*q.v.*), were set up throughout Germany for their reception and they were fed, clothed, and housed until it was possible to send them back to their countries of origin. When U.N.R.R.A. came to an end in 1947, some 800,000 persons remained. Many, particularly Poles and Balts, feared to return to their country of origin. All were passed to the care of a new U.N. body, the international refugee organization. Israel, est. 1948, absorbed most of the Jews. The U.K., Canada, Australia, Belgium, Venezuela, Chile, Brazil, were among other countries that gave asylum to selected refugees. But disbandment of I.R.O. in 1950 would, it was expected, leave some thousands without resources.

**Displacement.** Nautical term indicating the weight of water displaced by a ship or any other floating body and consequently the weight of the body itself. Since 35 cu. ft. of water weighs one ton, the displacement tonnage of a vessel is found by dividing by 35 the number of cu. ft. of water displaced when the ship is immersed to its load line.

**Displayed.** In heraldry, a bird fronting the spectator, with outstretched wings and legs, is said to



Displayed, in heraldry

abased" or "abaissée."

**Disposition** (Lat. *dis*, apart; *ponere*, to place). Word with two or more meanings. In psychology, it means a relatively permanent tendency to act in any certain way either because the organism inherited the tendency or because it learnt it from experience. It may mean simply the predominant bent, or constitutional habit, of one's mind.

Legally, disposition refers to the disposal of property, especially at death. In Scotland it has a special meaning, that of a deed by which property, generally landed property, is transferred. Disposition and settlement refers to a deed by which a man, in lieu of making a will, arranges for the disposal of his property on his death.

**Disputation.** Literally, a verbal contest. The word was used at the universities in the Middle Ages and later for a formal argument, in which a certain proposition was upheld by one and attacked by another. For long it was the custom for those desiring to obtain a degree to prepare and read a Latin thesis, and then, in a disputation, to defend his opinions against certain persons chosen to oppose him. Many of the subjects were theological, such as the familiar Can an archdeacon be saved? or How many angels can stand on the point of a needle? About the time of the Reformation the word was applied to more serious verbal encounters between theologians, *e.g.* the one at Leipzig in 1519 on papal supremacy. See Degree; Scholasticism.

**D'Israeli, ISAAC** (1766–1848). British author, father of the earl of Beaconsfield (*q.v.*). Descended from a family of Jews, belonging to the Spanish Sephardim, he was born in London, May 11, 1766, and is famous as the compiler of four entertaining literary miscellanies, *Curiosities of Literature*, 6 vols., 1791–1834; *Calami-*

be displayed. As a rule the ends of the wings point upwards, but if the pinions point downwards the bird is described as "displayed

ties of Authors, 1812–13; *Quarrels of Authors*, 3 vols., 1814; and *Amenities of Literature*, a projected history of English literature of which 3 vols. appeared, 1841. He was made D.C.L. of Oxford for his *Commentaries on the Life of Charles I.*, 1828–30. He died at Bradenham House, Bucks, Jan. 19, 1848.

**Disruption.** Name given to the secession on May 18, 1843, of 420 ministers of the Church of Scotland on the question of the patronage of livings. The seceding ministers, who numbered nearly half the church ministers, were followed by their congregations. Under the leadership of Dr. Thomas Chalmers, they formed the Free Church of Scotland. See Chalmers; Free Church; Presbyterianism.

**Diss.** Urban dist. and market town of Norfolk, England. It stands on the Waveney, 19 m. S.W. of Norwich, on the railway. Formerly noted for "Suffolk hempen cloth," it now manufactures brushes and mats, and is an agricultural centre. There are weekly sales of livestock. Market day, Fri. Pop. est. 4,000.

**Dissecting.** Cutting apart the organs or tissues of a plant or animal in order to display the coarser structural features. Medical students are required to make a complete dissection of the body as part of their course for a medical qualification. See Anatomy.

**Disseisin.** Word of French origin, the opposite of seisin (*q.v.*). It meant in feudal times the act of dispossessing a man of something, especially of land. It was generally an illegal proceeding. See Feudalism.

**Disseminated Sclerosis.** Organic nervous disease common in the U.K. and Europe. The cause is still wholly unknown. It may well be infective in origin but behaves like no known infective disease. The family and personal history of the victim afford no clue to tracking the cause; and the disease attacks equally both sexes, usually between the ages of 16 and 30.

Patches of sclerosis, variable in size, establish themselves throughout the substance of the brain and spinal cord. The main signs are nystagmus (involuntary oscillatory movement of the eyeballs), intention tremor (uncertainty of action manifest only on voluntary movement), and scanning speech (mode of speech in which each syllable is pronounced over-distinctly); while the emotional and intellectual life is altered and



Isaac D'Israeli,  
British author  
From an engraving

unbalanced. The course of the disease is unpredictable, though febrile diseases and pregnancy influence it adversely. No remedy is of real avail, though certain cases respond favourably to the removal of streptococcal or other toxins. Other nerve tracts may be conditioned to carry on the work of those destroyed.

**Dissenter** (Lat. *dissentire*, to disagree). One who dissents from the doctrine or discipline of the established Church of England. The term came into use soon after the Revolution of 1688, and appears still to be the legal term. The name Nonconformist can be applied with historical accuracy only to those ministers and congregations who left the Church of England after the Act of Uniformity, 1662. See Nonconformity.

**Dissenting Deputies.** Association of laymen, representing the Presbyterian, Congregationalist, and Baptist denominations. It was formed in 1732, and has the privilege of approaching the sovereign and offering an address.

**Dissertation** (Lat. *disserere*, to discuss). Discourse or treatise of a formal kind. The word is specially applied to the essays or theses required by some universities from candidates for degrees of a kind not awarded after the usual examinations. Such are the degrees of doctor of literature (D.Litt.) at London, and of Ph.D. at many German universities. See Degree; University.

**Dissimulation** (Lat. *dissimilis*, unlike). In philology, a change whereby one of two similar sounds is made unlike the other. It is the opposite of assimilation (*g.v.*), but occurs far less frequently. Thus, in Latin *meridies* (mid-day) is for *medidies*; Latin *peregrinus* appears in Italian as *pellegrino*.

**Dissociation.** Term used in chemistry for the splitting of a molecule into simpler parts; it is used in two different ways: (1) to denote the breaking up of a molecule by the action of heat, (2) to explain electrolytic conduction, especially of aqueous solutions, by the breaking up of molecules into ions. Instances of the first use are the splitting of ammonium chloride by heat into ammonia gas and hydrochloric acid gas; also the splitting of phosphorus pentachloride into phosphorus trichloride and chlorine.

The second use of the term began about 1887, when it was brought in to explain the conductivity of aqueous solutions and electrolysis in general; a solution

of common salt was considered to be a mixture of solutions of sodium ions and of chlorine ions. Recent investigations have shown that crystals of common salt are not mere aggregations of molecules of NaCl, but of symmetrically arranged atoms (or ions) of sodium and chlorine. Consequently the dissolving of crystals of common salt in water

is effected by allowing water, not necessarily in the form of molecules, to intervene between the atoms or ions of sodium and chlorine.

**Dissociation.** In psychology, the separation of an idea or a desire from the control of the individual, making it coconscious, or the splitting of the personality into disunited parts. Alternating double or dual personality is a condition of mental dissociation in which the same individual shows an alternation of two different characters (*e.g.* Stevenson's Dr. Jekyll and Mr. Hyde). In multiple personality there are three or more such states.

**Dissolution** (Lat. *dissolvere*, to break up). Term used for the termination of an organized society. It is specially applied to a parliament dissolved either by the sovereign, acting on the advice of his ministers, or by the efflux of time, normally in the U.K. five years. Unlike many foreign assemblies, the British parliament, as a sovereign body, can prolong its own existence, thus postponing a dissolution. A dissolution differs from a prorogation, which marks the end of a session and does not necessitate a general election. (See Parliament.) The word is also used for the termination of a partnership. This may be dissolved either by the lapse of time or after due notice given, the change being announced in The London Gazette in order to safeguard the rights of creditors. See Partnership.

**Dissonance** (Lat. *dissonare*, to disagree in sound). Term in music (1) sometimes used synonymously with discord; (2) to denote a combination of two sounds whose vibration numbers are not in simple ratio (*i.e.* not both occurring in the first six notes of the same



Distaff. Peasant girl of Normandy with spinning wheel and distaff

harmonic series). Such pairs of dissonant sounds produce "beats" or waves instead of coalescing in a steady combined tone. See Beat; Discord; Resonance.

**Distaff** (A.S. *distæf* = *dise*, bunch of flax; *stæf*, staff). Short cleft stick on which was wound wool, carded cotton, or flax to be spun. It was held under the left arm, and the threads drawn from it were

twisted by the forefinger and thumb of the right hand. The spun thread was wound on a bobbin suspended from the thread and rotated so as to prevent the spun thread from untwisting. It is also used for the staff or rock of a hand-spinning wheel, upon which flax for spinning is suspended.

The word also symbolises feminine attributes, as in distaff rights, the distaff side of the family.

**Distemper** (Lat. *dis*, out of proportion; *temperare*, to mix). Paint in which the medium consists essentially of an aqueous solution of glue. The solid ingredients usually contain a high proportion of lime so that in time the film becomes fairly resistant to water from the formation of insoluble calcium carbonate by combination with the carbon dioxide of the air. In washable distempers casein replaces the glue. Casein is insoluble in water but soluble in limewater. When the paint dries, the lime is slowly precipitated as carbonate and the liberated casein is left insoluble. The whole film thus becomes water-resistant. A further modification is to emulsify such a medium with a drying oil, *e.g.* linseed. Paints of this type are sometimes called "oil bound water paints." See Paint; Tempera.

**Distemper.** An influenza-like condition from which many animals suffer. The term is most often used to describe the condition in the dog. The disease is caused by a virus; it is not so much the fundamental illness which does serious damage as the secondary invading germs, which can attack the respiratory system causing pneumonia and allied complications, the digestive tract causing severe diarrhoea and exhaustion,

or the nervous system causing hysteria and fits.

The death rate among dogs and the whole picture of treatment has been altered by the use of active immunisation. Very young puppies are unsuitable subjects; they can be passively protected by the inoculation of serum. The dog must be in sound health and under professional care during the whole treatment for protection. The method of choice is to give a vaccine first, to be followed some 14 days later by an injection of virus. Another method is to give the virus first, followed within 24 hours by an injection of serum. Serum has little value in late cases with secondary infections, but in the early stage of the disease it may prevent an attack from becoming severe.

**Distich** (Gr. *distichos*, in two rows). Classical term for a couplet containing the complete expression of a single idea. Strictly, the distich consists of a hexameter and a pentameter line; it is the form of many of the epigrams in Greek anthologies. *Pron.* distik.

**Distillation** (Lat. *destillare*, to drop down). Physical process by which a liquid is partially or wholly vaporised and the vapour then recondensed to the liquid state. Modern distillation apparatus consists of three parts: a still in which the liquid is heated, a condenser in which the vapours are cooled, and a receiver in which the liquefied vapours are collected. When the process of distillation is to separate two or more liquids of different boiling points (fractional distillation) an additional device, the fractionating column (*q.v.*), may be interposed between still and condenser. For small scale work in the laboratory the apparatus is usually made of glass, whereas in industrial equipment metal is commonly used. The cooling medium in the condenser is generally air or water, but for very volatile substances the greater cold necessary may be supplied by ice, ice-salt mixtures, solid carbon dioxide, liquid air, or other liquefied gases. In most small-scale work distillation is an intermittent process, the operation being carried to completion on one batch before the next is introduced into the still. In many large-scale operations, however, there is a continuous feed of raw material into the still and a continuous withdrawal of residue and vapour.

Some liquids decompose at temperatures below their normal boiling point; distillation of them

is effected in a partial vacuum. A liquid boils when its vapour pressure equals the external pressure; reduction of pressure in the still is therefore equivalent to a reduction in vapour pressure of the liquid, which can thus boil and distil at a lower temperature than normal. Consideration of Dalton's law of partial pressures shows that the introduction of steam into the still (steam distillation) has a similar effect.

In the chemical laboratory this important process is used for separating the solvent from solutions and for recovering pure liquids from mixtures of liquids. Fractional distillation is also used as a method of analysis, *e.g.* the analysis of hydrocarbon gas mixtures by preliminary liquefaction and subsequent fractional distillation of the liquid.

Distillation is much employed industrially, the typical example being the production of ethyl alcohol as both beverage and solvent. Others are the production of pure water (distilled water); preparation of potable water from sea water; separation of methyl alcohol (wood spirit) from the products of the destructive distillation of wood; fractionation of tars and crude petroleum; production of essential oils; recovery of ammonia from the crude ammonia liquor of the coal tar industry; and metallurgical processes such as the purification and recovery of mercury.

Normal distillation involves only physical change. When processes associated with chemical as well as physical change are referred to as distillation, the prefix "destructive" or "dry" is used. The best example is the destructive distillation of coal by heating in retorts to produce coal gas, coal tar, ammonia, and coke. Other substances treated in a similar manner are wood, for the production of wood tar (Stockholm tar), wood spirit, acetone, turpentine, and charcoal; and oil shale, for the production of shale oil, ammonia, and paraffin wax. See Alcohol; Petroleum; Refinery.

**DISTILLATION PLANTS.** During the Second Great War, compression distillation plants were developed to provide a constant supply of fresh water from seawater, the apparatus being used extensively to prolong the radius of action of submarines and other craft where lack of space prevented the fitting of large fresh-water tanks.

Compression distillation depends upon mechanically compressing

the steam and leaving the evaporation compartment of the still to raise its temperature a few degrees. At the higher pressure, the steam condenses above the boiling point of the evaporating raw water, so that the heat can flow from the condensing steam to the raw water and boil it. The average unit had a distillation capacity of 250 gallons of fresh water per hour.

Chief advantages of the compression distillation unit are: it is entirely self-contained; requires no cooling medium; is stable in operation; needs a minimum of attention, and can be adjusted to yield directly from seawater sterile distilled water of the highest chemical purity suitable for batteries. Stills operating on a similar principle, but with a lower distillation capacity, form part of the equipment of lifeboats and aircraft dinghies. They work on paraffin or solid fuel and produce fresh water from the sea in a few moments. These stills saved hundreds of lives of shipwrecked men during the U-boat campaign of the Second Great War.

**Distillers' Company.** London city livery company. It received its first charter in 1638, and rules

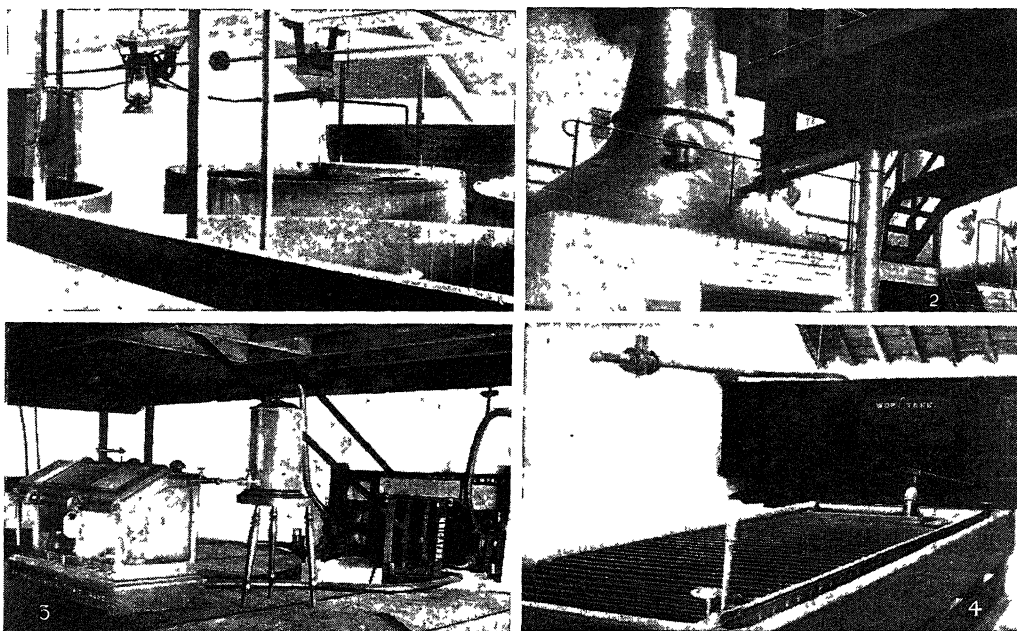


Distillers' Company arms

and by-laws were drawn up in 1639 by Sir Theodore de Mayerne, physician to Charles I, and Dr. Thomas Cademan. A second charter, granted 1687, was confirmed in 1690. The order of the common council, 1774, that all distillers within civic jurisdiction should be members of the company has long been obsolete. The offices are at 49, Leadenhall St., E.C.3. See City Companies.

**Distilling.** The term used to denote process by which certain alcoholic beverages are obtained by distillation (*q.v.*). According to ancient writers, distilling was a Chinese art long before it was practised by the Arabs in the 7th century. The Arabs distilled essence of turpentine from pitch; they also distilled rosewater and other perfumes, assisting condensation by applying wet cloths to the heads of their crude stills.

Alcohol was unknown to the Arabs as late as the 12th century. Arrack distilled from toddy, the fermented sap of various palm trees, is said to have been known in India since 800 B.C., and in Ceylon



Distilling. 1. Fermenting vats, where yeast is added before the liquor is distilled. 2. Wash and spirit still. 3. Spirit safe, where the distillation is first run off from the still and tested. 4. Horizontal refrigerator for cooling the spirit

from time immemorial. Brandy (eau de vie) is distilled from weak wines. Cognac, the brandy of Charente, is distilled in ancient alembics from locally grown grapes.

Whisky is distilled from a fermented solution of malted barley, or malted barley mixed with other cereal grain. Malted barley only is usual for Scotch pot-still spirits. A small proportion of oats is generally added to the mash for Irish whisky. What is known as grain whisky, both in Ireland and Scotland, is obtained by using a large proportion of unmalted grain (maize or Indian corn) in the brew. Malting develops the enzyme diastase, which in suitable solution has the power of converting starch into fermentable sugars. Malt is crushed, and unmalted grain ground for brewing. The hot saccharine liquor run from the mash tun is known as wort. After cooling it is "pitched" with yeast and fermented to produce alcohol. When fermentation begins wort becomes wash.

Rum is distilled from a fermented wash, the wort for which is prepared by dissolving sugarcane syrups in hot water and fermenting with the "skimmings" from collections of wort in active fermentation. Molasses spirit for industrial uses is prepared in Great Britain by dissolving mo-

lasses in water and fermenting with specially prepared molasses wort in active fermentation.

With the exception of Hollands, gin is not distilled directly from wash. The finest London gins are made by distilling good quality grain spirit in which juniper berries and other flavouring ingredients have been macerated for 24 hours or so. Another method, favoured in France, is to conduct the spirit vapour in specially made stills through a small container filled with juniper and flavouring spices. Considerable quantities of gin are compounded by mixing gin essence with grain spirit.

Types of stills vary from the simple pot-still, which is an alembic or pot covered by a head with an escape pipe for vapour, to complicated column stills fed continuously with fermented wash and discharging highly rectified spirit for days without intermission. In spirit distilling, normally the object is to separate the alcohol from a fermented wash or wine and to collect a liquid of higher alcoholic strength. This is possible because of the difference between the boiling points of water (100° C.) and alcohol (78.35° C.). As the wash is heated in the still, whether by fire or steam, the vapour driven off contains in its early stages a higher proportion of alcohol than of

water. As the alcohol vaporises, the liquid becomes less alcoholic, and its boiling temperature rises. By reason of this, and because of the affinity of alcohol for water, a sharp or clean separation is not possible, and the vapour is always to some extent charged with some proportion of water. Water fractions are reduced by condensers in series furnished with reflux pipes, but in pot-still distilling it is usual for the vapour to be condensed by passing through a "worm" which is water-cooled outside. As there are invariably other liquid matters in fermented wash or wine, the water and spirit vapours are contaminated with impurities. These combine in what is known as fusel oil, or higher alcohols. Traces of so-called impurities give brandy, whisky, or rum its characteristic flavour.

Patent or column stills for continuous distilling have developed from a single column still designed by a French distiller, Cellier-Blumenthal (1808), for distilling wine, washes brewed from grain, and potatoes. The inner fittings of his column included lenticular plates in the lower section and a few bubbling plates in the upper section. Improvements, including St. Marc's fire-heated column and Stein's, were soon made and introduced in the U.K. The only patent still of old time that survives is

Coffey's apparatus (see Alcohol illus.), the usual equipment of grain spirit distilleries, which is built in two columns: (a) the analyser, and (b) the rectifier. Each consists of super-imposed frames separated by copper diaphragm sheets. With the exception of the spirit sheet and the upper sheets of the rectifier, all diaphragms are perforated. Each column is enclosed top and bottom with binding sheets. Drop tubes communicate downwards from frame to frame.

The analyser vaporises fermented wash and the rectifier condenses spirit vapour. Condensation of the spirit vapour is expedited by running the wash pipe through nearly every diaphragm in the rectifier, the wash growing hotter as the pipe descends the column until it has almost reached boiling point by the time it is discharged into the upper chambers of the analyser. Wash is exhausted of its spirit vapour long before it reaches the bottom of the analysing column, but several frames are provided as safety measures. The heavier oily alcohols condense in the lower frames of the rectifying column while lighter spirit vapour is purified as it is forced upwards by pressure of vapour from the analyser through layers of condensates on each diaphragm sheet until a sufficient degree of purity is obtained (say 65 to 67 or even 68 overproof). This is expected in the top frames of the rectifier, which are water-cooled to condense the strong spirit vapour for discharge from the spirit sheet. The hot spirit is run through a refrigerator and observation safe to the spirit receiver. Exhausted wash is discharged from the analyser. Impure spirits are discharged from the rectifier to one or more vessels designed for trapping fusel oil, while the tailings from distilling, when the still is being worked off, are run from the spirit sheet through a branch pipe to feints receivers.

The continuous distilling system used on the continent of Europe, such as the French Barbet and the German Ilge, work on similar principles, but their fittings and diaphragm arrangements are different.

W. H. Nithsdale

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**Distinguished Conduct Medal.** British military decoration. Instituted in 1862, it is conferred upon



Distinguished Conduct Medal

non-commissioned officers and men for "individual acts of distinguished conduct in the field." Familiarly known as the D.C.M., it is (as from Aug. 1, 1918) awarded for "services in action" only. The obverse of the medal bears the effigy of the reigning king; reverse, inscription, "For Distinguished Conduct in the Field." The ribbon is three stripes equal width, outside red, centre blue. In the First Great War the number of D.C.M.s awarded was 24,391 for services in the field. During the Second Great War 1,531 D.C.M.s and 7 bars were awarded.

**Distinguished Flying Cross.**

British decoration awarded for gallantry in face of the enemy to officers and warrant officers of the Royal Air Force. It was instituted in 1918, and the ribbon is purple and white, striped diagonally. Originally the ribbon had horizontal bands, but this was altered in 1919. Since April, 1941, the D.F.C. may be awarded to officers and warrant officers of Allied air forces serving with the R.A.F., to the personnel of any air force raised within the British Empire, and to officers and warrant officers of the army and Royal Navy flying on duty with the R.A.F. During the Second Great War, 18,971 Distinguished Flying Crosses were awarded.



Distinguished Flying Cross

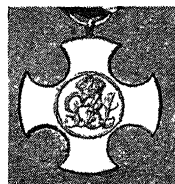
**Distinguished Flying Medal.**

British decoration instituted in 1918 for award to non-commissioned air crew personnel of the Royal Air Force for acts of gallantry when flying against the enemy. Since 1941 the D.F.M. may be awarded to personnel of any air force raised within the British Empire, and during the Second Great War it was awarded to personnel of Allied air forces serving with the R.A.F., and to non-commissioned personnel of the army and Royal Navy flying on duty with the R.A.F. During

the Second Great War 6,380 Distinguished Flying Medals were awarded. The ribbon resembles that of the D.F.C., but has narrower stripes.

**Distinguished Service Cross.**

Silver cross established in Britain in 1901 as the Conspicuous Service



Distinguished Service Cross

Cross, its award being confined to warrant officers and subordinate officers of the navy whose services have been noted by special mention in dispatches. In Oct., 1914,

the present title was substituted and the scope of the award extended to include commissioned officers of the rank of lieutenant and below. The ribbon is three stripes equal width, outside blue, centre white. The number of Distinguished Service Crosses awarded in the Second Great War was 4,460.

**Distinguished Service Medal.**

British medal instituted in Oct., 1914. Its award is confined to chief petty officers and lower ratings in the navy, and to non-commissioned officers and men in the marines, and it is granted to those "who set an example of bravery and resource under fire, but without performing acts of such pre-eminent bravery as would render them eligible for the Conspicuous Gallantry Medal." During the Second Great War 6,693 Distinguished Service Medals were awarded. The ribbon is three stripes equal width, outside blue, centre white with a thin blue stripe.



Distinguished Service Medal

**Distinguished Service Medal**

(INDIA). Award instituted by Edward VII, June 25, 1907. It is open to the rank and file of the Indian army, and during the First Great War was also opened to other troops acting under orders from the government of India. The medal bears the sovereign's profile, the reverse having a laurel wreath inscribed "For Distinguished Service." The ribbon is deep violet with borders of blue.

**Distinguished Service Order.**

British naval, military, and air force order given to officers. It was



Distinguished Service Order badge

instituted by Queen Victoria, Nov. 9, 1886. It ranked next to the Order of the Indian Empire until 1902, when King Edward caused it to rank after

the Royal Victorian Order. Recipients are called companions, the reigning monarch being the sovereign of the order. British officers only are eligible for the companionship, but foreign officers who have been associated with the British forces may become honorary members. Officers can be nominated only after their names have appeared in dispatches for "meritorious or distinguished service in the field or before the enemy."

The badge of the order is a gold Maltese cross, enamelled white, edged gold, having on one side the imperial crown in gold and on the reverse the imperial and royal cipher; it is suspended from the left breast by a red ribbon, edged blue. Appointments are by royal warrant. In the First Great War 8,862 were awarded for services in the field, 695 first bars, 70 second, and 6 third; also 21 D.S.O.s for services in connexion with the war. Since 1917 officers of the Merchant Navy have been eligible for the award. During the Second Great War, 3,691 D.S.O.s were awarded, of which the Royal Navy gained 685, the Army 1,928, the Royal Air Force 1,078, and the Merchant Navy 14.

**Distortion.** In metallurgy, an alteration from the usual or ideal shape, resulting from unequal cooling of a casting or by the quenching of a mass of unequal section. Distortion changes the physical and mechanical properties of a metal, there being usually a tendency for the metal or alloy to harden. Generally tensile strength is raised and ductility is reduced, the hardness increasing also; but certain lead alloys actually soften when distorted in a suitable manner. These changes in properties result from modifications in the crystal structure of the metal, which reveals under the microscope a change in orientation of its grain structure. In severe distortion brittleness may result and annealing be necessary to restore ductility. Distortion practised deliberately will produce desired shapes; e.g. drop-forging is performed hot, and wire-drawing is a cold-working process.

**Distraint** OR **DISTRESS** (Lat. *distingere*, to pull asunder). In English law, the right to seize goods, without process of law, as security for a debt. The most usual case is that of a landlord seizing a tenant's goods for rent. Distress must now be levied by the landlord himself or a bailiff certified by the local county court, and only between sunrise and sunset. No forcible entry can be made. Wearing apparel, beds, and bedding up to the value of £5 must be left on the premises; and if the goods of a lodger, sub-tenant, or other person than the tenant (except his wife) are seized, they can be claimed by the owner under certain conditions. Tools and implements of trade that do not exceed £5 in value may not be taken; the excess over £5 may be taken only if there is no other sufficient distress. An action lies for irregular or wrongful distress. By legislation introduced during the Second Great War a landlord could not exercise his right of distress without the leave of the court. See Rent Restriction.

**Distributary.** One of the many channels of a delta. The waters of a tributary or affluent flow into the main river, those of a distributary flow from the main stream. The distributaries of the Mississippi delta are known as passes.

**Distribution.** Term used in economics and commerce with various meanings. The distribution of wealth or of goods among various classes of the community may refer to a statistical comparison of standards of living. Distribution is also the means by which goods are conveyed to purchasers; this aspect is considered under Retail Distribution.

In printing, type which has been set and afterwards broken up is said to be distributed or "dissed."

At bridge, distribution is (1) the pattern in which the 13 cards in a player's hand are divided among the four suits; (2) the pattern in which the cards of any one suit are divided among the four hands.

**Distribution of Animals.** Land-locked animals have evolved during a period of important changes in the configuration of the land masses of the earth's surface. The study of animal distribution shows the history of some of these changes most strikingly. The restriction of some forms to the Australian region and the absence of placental mammals there show that Australia was isolated too early to allow the invasion of ordinary mammals. On the other

hand, the finding of river-dwelling fish obviously closely related on the W. coast of Africa and the E. coast of South America is strong evidence that these lands were once contiguous. This study will always be associated with the name of Alfred Wallace, though the simplicity of his original ideas has not been upheld by increasing observation.

**Distributor.** Device for sending an electric current through a number of different paths in turn. It consists of a rotating arm which forms part of the common circuit and touches a number of brass contacts as it revolves, each contact being a terminal of one of the alternative paths. Distributors supply high tension current to the sparking plugs of multi-cylinder motor car engines from a magneto or induction coil; or feed a number of coils (each serving a separate cylinder) with low tension current from a common source.

Distributor is the name for low tension street cable for supplying light, heat, or power to the community.

The distributor is also an important feature of multiplex telegraphy, enabling as many as eight messages—four in each direction—to be sent simultaneously over a single wire. A distributor is required at each station; and the two arms are kept in step by a phonic wheel under control of a tuning fork. Assuming four messages to be sent in one direction: the first transmitting and its corresponding receiving instrument will be connected up with contacts 1, 5, 9, 13; the second with 2, 6, 10, 14; and so on. If the contacts are 200 in number, and the arm revolves three times per sec., every instrument is in circuit with the line

$$\text{wire } \frac{200 \times 3}{4} = 150 \text{ times per sec. ;}$$

and a signal, though actually sent out as a series of impulses, has the effect of a single impulse, owing to the inertia of the moving part of the receiver. See Circuit, Electric.

**Distributor.** Agricultural implement for evenly distributing artificial manure in quantities that can be definitely regulated. A distributor consists essentially of a rectangular box mounted on wheels, with a slit below from which the manure falls. This is stirred up and prevented from getting lumpy by various devices, and in one type centrifugal force is brought into play by the action of revolving horizontal disks. Some machines distribute artificial manure and seeds simultaneously.



**District Attorney.** Public prosecutor in the U.S.A. (1) Federal district attorneys are appointed by the president for each federal judicial district as deputies of the attorney-general. (2) State district attorneys (sometimes called county attorneys or circuit attorneys) are usually elected by popular vote. Members of the former class commonly figure less prominently in the public eye than those of the latter, since most crimes, especially those of a sensational character, are offences against state laws rather than federal laws. A state district attorney often needs to be not only a skilled lawyer but a man of no little moral and physical courage, as he may have to deal with racketeers and gangsters who possess wealth and influence and are prepared to go to any length in self-defence. An official who can land them in prison may become a national figure; e.g. W. T. Jerome, who cleared up the gambling resorts of New York City; J. W. Folk, whose fight against municipal corruption in St. Louis led to his becoming governor of Missouri; C. S. Whitman, elected governor of New York after his successful prosecution of a murderer; and Thomas Dewey (*q.v.*).

**District Council.** In the United Kingdom, a body elected to carry on local government. There are two types of district council, the urban and the rural, both established in England and Wales by the Local Government Act of 1894, later governed by the Act of 1933. Every urban district has a council. Its members are chosen by the electorate in April, and serve for three years; sometimes one-third of them retire each year, sometimes all retire at once. Women are eligible. Meetings are held at least four times a year. Councils elect their own chairmen, who are, by virtue of their office, magistrates for the county. They are the sanitary authority and the highway authority for roads which are not under the ministry of Transport or county council. They are also the authority for carrying out provisions of the Town and Country Planning Acts.

Every rural district, which may be either a single parish or a group of parishes, has a council. Provisions as to its members, officers, and meetings are the same as those relating to urban district councils. The minister of Health may confer some of the functions of an urban upon a rural district council, or apply to rural districts any Act referring to an urban district.

In Scotland district councils were established by the Local Government (Scotland) Act, 1929, under schemes prepared by each county council. The provisions of the Local Government (Scotland) Act, 1894, as to parish councils were applied to district councils, which took over some functions of the abolished parish councils.

**District Line.** Part of the London underground rly. system. With an E. terminus at Upminster, it comes on to the Metropolitan inner circle at Tower Hill, leaves it at Gloucester Road, and divides into four W. branches to Richmond, Wimbledon, Hounslow West, and Ealing Broadway, with a connexion to Uxbridge. The section from Westminster to Kensington was opened in 1863, and in 1871 the line began at Mansion House. It was built on the "cut-and-cover" system; the cuttings being roofed over and sometimes built upon. Beyond the central area the line is no longer underground, but often elevated. The West Bourne stream crosses over it in a steel conduit at Sloane Square stn. Motive power was originally steam, but early in the 20th century the line was electrified. *See* London Transport.

**District Nurse.** One who provides skilled nursing and midwifery for persons of all classes in their own homes, the necessitous being nursed free. She may undertake general nursing only or combine this with midwifery. The Queen's Institute of District Nursing was founded in 1889, and is the central body to which practically all the county and district nursing associations of the U.K. are affiliated. Over 8,000 district nurses cover 98 p.c. of the U.K.

**District of Columbia.** Territory of the U.S.A. Enclosed on three sides by Maryland, and bordered by the Potomac on the S.W., it covers 69 sq. m. and is continuous with the federal capital Washington. The surface is hilly or undulating, with fertile valleys watered by the Potomac and its E. branch, the Anacostia, which forms the E. boundary of the district.

Originally the area was 100 sq. m., granted by Maryland and Virginia, but in 1846 the portion ceded by Virginia was restored to that state. It held the city of Washington and Georgetown until 1895, when the latter was incorporated as part of the capital; it is now a residential suburb. The district was made the seat of government by Act of Congress July 16, 1790, and in 1800 the U.S.A. assumed

authority over it. The continental congress had already assembled ten times in eight different places.

Washington himself laid out the site, having sold his lands in the neighbourhood, and engaged the French architect Pierre L'Enfant to design the city. In 1871 the district was designated a territory, with a governor and legislature and delegates to congress. Now the latter has exclusive jurisdiction over it; administration is by three commissioners, two of them residents appointed by the U.S. president for three years, and the other a member of the army corps of engineers. The district is the seat of George Washington and Georgetown universities, the latter a Jesuit institution, of the Catholic university of America, Trinity College (for women), Howard university (for negroes), the American university (Methodist), etc. Industries produce almost wholly for government and local consumption. Pop. 663,091. *See* Washington.

**District Registry.** Office in the charge of a registrar, where the wills of persons dying in that district can be proved and kept for inspection. An Act of 1857 established district registries in many of the chief towns in England and Wales. The principal registry is at Somerset House, London.

**Distringas.** Term used in English law. At first it was a writ to compel a person to do something by distraining on his property, and in this sense it is obsolete. But there is a legal process often called *distringas* whereby a person who claims to be interested in stock in any company can put a restraint upon its transfer so that it cannot be got rid of until his claim is satisfied. *See* Distrain.

**Ditchling Beacon.** Hill of Sussex, England, one of the highest points of the South Downs. Rising near Hassocks, about 7 m. N. of Brighton, it is 813 ft. high, and on its summit are remains of a British camp.

**Dithion** or **SODIUM DITHIOSALICYLATE.** Remedy for rheumatism. The dithiosalicylic acid is made by heating salicylic acid with sulphur chloride, and from this the sodium salt is obtained. Dithion is derived from Greek *di*, double, two, and *theon*, sulphur.

**Dithmarschen.** District of N. Germany, in Holstein. Forming part of the long belt of dune country which borders the North Sea, the area is bounded by the Elbe and the Eider, and lies on the W. side of the isthmus of Jutland.



**Dithyramb** or DITHYRAMBUS. Irregular ode couched in enthusiastically lyrical language. Originally a choric dance and song in honour of Dionysus, the term dithyrambic is now applied to lyric poetry characterised by vehement passion. See Poetry; Verse.

**Dittmar**, KURT (b. 1890). German soldier and propagandist. He was born at Magdeburg, son of a historian. A captain after the First Great War in the new Reichswehr, he became a colonel in 1936, and commanded the army engineers on the outbreak of war in 1939. He led a division on the Lapland front in 1941. From May, 1942, Dittmar broadcast commentaries on the army; his comparatively objective reports being often at variance with those spread by Goebbels.

**Diu**. Island off the N.W. coast of India, belonging to the Portuguese. It is situated at the S. extremity of the peninsula of Kathiawar, 170 m. N.W. of Bombay. Area, 20 sq. m. It is the seat of a governor, who is subordinate to the governor-general of Goa. Salt is worked. The town of Diu was at one time a great trade centre, where the Portuguese withstood a famous siege in 1545, and its buildings bear evidence of former prosperity. The silting up of its harbour is the principal cause of its decline. Pop. 14,000.

**Diuretics** (Gr. *dia*, through; *ouron*, urine). Drugs employed to increase the quantity of urine excreted by the kidneys. Their administration results in a diluted urine when it tends to precipitate solid matter as in certain forms of Bright's disease and heart disease; and in dropsical conditions, most often associated with heart or kidney failure, helps to diminish the amount of fluid in the body. Digitalis, caffeine, juniper, and potassium citrate have a diuretic action.

**Divali**. Hindu feast of lamps, celebrated on certain dark autumnal nights in honour of various divinities, notably Lakshmi (*q.v.*). Lamps are carried in the streets, there are displays of fireworks, and from the floating or sinking of little rafts decked with lamps favourable or unfavourable omens are drawn. During the festival tradesmen open their account books for the new year, and gamble to test their luck. In Bengal, divali is known as Kali pujah, festival of Kali (*q.v.*).

**Divan** or DIWAN. Persian word of many meanings: a bundle of written sheets, a collection of

poems by a single author, an account book, register, office, custom house (Fr. *douane*), council, council chamber, reception room, cushioned seat or couch. In the 18th and 19th centuries European rooms fitted with seats and cushions in the Turkish style, smoking lounges, and tobacconists' shops were called divans. In Anglo-Indian usage the word was used of the prime minister of a native state, of the principal native officer of a mint or other government institution, and, in Bengal, of the native steward of a European household.

**Dive**. Term in aeronautics to describe the nose-first descent of an aircraft followed at its finish by a flattening out to level flight. When a dive is made with the engine running it is known as a power dive and tends to "over-rev" the engine, because the increased pressure on the face of the airscrew blades, due to the rapid downward velocity of the aircraft, accelerates their normal revolutions. Power diving is the basis of the technique of aerial attack called dive bombing.

**Dive Bombing**. Method of low level precision bombing. It was developed by the German Condor Legion in the Spanish Civil War and later used with devastating effect in the invasion of Poland in 1939 and of France and the Netherlands in 1940. Dive bombers formed an essential component of the Panzer division, for which they acted as close support artillery. They rendered ineffective the defending artillery and armour, and then transferred their activities to points deeper within the enemy lines.

In a dive bombing attack the aircraft is inclined towards its target at an angle of 40°-60°, its downward velocity being checked by dive brakes (*q.v.*). The correct moment for release of the bomb is immediately after the aircraft flattens out; if the bomb were dropped whilst the aircraft were actually diving on the target it would fall short. No sight is used, the pilot relying on judgment.

The effectiveness of the dive bomber decreased when it encountered strong opposition. When

150 German dive bombers attacked the aircraft carrier *Illustrious* in Valletta harbour in 1942, 90 were shot down by ship and shore A.A. batteries. The principal defect of dive bombing was that the aircraft, being pointed directly at the target, was also directed at the guns defending it. Moreover the aircraft, slower than a fighter, could not easily escape when engaged. The German Junkers 87 did achieve success early in the Second Great War. The nearest British approaches to the dive bomber were the Hurricane "tank-buster," first used in the Western Desert, the Typhoon, used in the invasion of W. Europe, and the Fairey Barracuda, used by the Royal Navy.

**Dive Brake**. Adjustable flap fitted to the trailing edge of an aeroplane wing to retard velocity when diving. The flaps are controlled by the pilot, and when down lie approximately at right angles to the surface of the wing. The brake thus offers opposition to the upward flow of air and slows down the aircraft's rate of descent.

**Diver** (*Colymbidae*). Name given to a family of birds. There are four British species, all found in Scotland, and more rarely in England. They have feet set far back, which gives them an upright attitude when standing and an awkward gait when walking; but in the water they somewhat resemble geese with long sharp beaks. They feed entirely on fish, and spend the winter at sea, visiting the inland waters in the nesting season. They rarely fly except in the migrating season. They can remain under water more than five minutes.

The Great Northern diver (*Colymbus immer*), the largest of the group, is found in W. Europe, Iceland, and Canada. It is over 30 ins. long, and has black plumage thickly spotted with white on the upper parts, with white below. The white-billed Northern diver (*C. adamsii*) is very rare. The black-throated diver (*C. arcticus*), found in the Hebrides, Scandinavia, N. Asia, and America, is somewhat smaller, and has a grey head and purplish black throat. The red-throated diver breeds locally in Donegal.



Diver. Great Northern diver, largest of the group

**Diver**, KATHERINE HELEN MAUD (d. 1945). British novelist, known as Maud Diver. Born in India, she passed most of her early life there or in Ceylon, but settled in England after 1890. By name Marshall, she married Lt.-Col. Diver in 1896. Her first novel, *Captain Desmond*, V.C., 1907, published when she was 40, established her as a popular writer on British India, especially the N.W. frontier. From a series of similar novels she turned to history with *Kabul to Kandahar*, and *In Royal India*, 1942. She died Oct. 14, 1945.

**Diver's Paralysis.** Disease which occurs in divers and those working in caissons under increased pressure, owing to excessive absorption of nitrogen by the blood. See *Caisson Disease*.

**Diverticulitis.** Inflammation of a sacculated portion of the colon. The wall of the lower gut gives before pressure, forming pockets, in which the food mass lodges. This mass, unable to clear itself, gives rise to irritation, and then to localised inflammation, causing discomfort and pain. X-ray examination facilitates recognition of the condition. It is found equally in men and women after the age of 40, especially when there is a history of constipation. It is associated often with irritability of the bladder. Reflex indigestion is often found as in appendicitis. Treatment consists in a low-residue diet, free from pips and skins of fruit and salads. Some paraffin preparation should be given with every meal so that no hard mass may form in the intestine, and drugs of the belladonna family are useful in preventing painful spasm.

**Dives** (Lat., rich). The rich man in Jesus' parable of the Rich Man and Lazarus (Luke 16, vv. 19-31) is often designated by the Latin equivalent *Dives*. His lot in this world and the next is contrasted with that of Lazarus, a beggar; whereas Lazarus is comforted, *Dives* suffers anguish.

**Dives-sur-Mer.** Port and watering-place of Normandy France. In the department of Calvados, 15 m. N.E. of Caen, it stands at the mouth of the little river Dives. It has an old church and 16th cent. wooden market buildings. It was long a Norman port, and from here William the Conqueror is supposed to have sailed to England in 1066. It shares a station with Cabourg, a more modern place with a casino. A metal working industry is carried on near by.

**Divide.** Word used in America and Australia for a mountain range that divides two valleys. An example is the Great Divide in Wyoming, or the Great Dividing Range (*q.v.*) in Australia.

**Dividend** (Lat. *dividendum*, something to be divided). Usually the money distributed from profits to the shareholders in joint stock companies. Dividends are often of two kinds, those on preference or preferred shares which are at a fixed rate, and those on the ordinary shares which vary with the profits. Dividends on preference shares are either cumulative or non-cumulative. If the former, dividends which are not paid owing to lack of profits remain a charge on the company's future profits, and must be paid before the ordinary shareholders receive anything; if the latter, no liability is carried forward. The latter class, like the ordinary shares, stand or fall by the results of a single year.

Most companies pay two dividends a year: one an interim dividend and the other a final one, paid after the year's accounts are made up. The directors, having before them the audited accounts, decide upon the amount and recommend its payment to the shareholders, who as a rule simply pass it. Directors are liable to the company if they knowingly pay dividends out of capital. Income-tax is usually deducted before the dividend is paid. Dividends are sent by means of dividend warrants, which are stamped to serve as cheques. Dividend is also used for the money paid to the creditors of a bankrupt in settlement of claims; and to winners of football pools. See *Company Law*.

**Divi-divi** (*Caesalpinia coriaria*). Small tree, member of the family Leguminosae. It is a native of S. America. The leaves are divided into four to seven pairs of leaflets, the latter again into 16 to 24 slender segments. The white flowers are in branched sprays, and are succeeded by S-shaped flattened pods which, owing to the tannin they contain, are exported for tanning purposes, and known to commerce as *divi-divi*, *libi-divi*, or *libi-dibi*.

**Divina Commedia.** Dante's great poetic trilogy, *The Divine Comedy*, probably completed in 1321; earliest extant editions, printed 1472. The title *Commedia* was used because the story has a happy ending; the adjective *Divina* has been added by posterity. The Soul of Man, represented in the poet, passes from the worldly life

into sin, and, with the shade of Virgil as a guide, to a vision of his misery in Hell. By repentance and penance the marks of the seven deadly sins are effaced in Purgatory; towards the close of which the shade of Virgil leaves him, and Beatrice, Heavenly Love, becomes his guide through Paradise. See *Dante*; Italy; Literature.

**Bibliography.** The standard English translation is that of H. F. Cary, 1814, and there is an admirable one by Longfellow, 1867; consult also W. W. Vernon's *Readings on the Inferno*, 2nd ed. 1906; *Purgatorio*, 3rd ed. 1907; *Paradiso*, 2nd ed. 1909.

**Divination** (Lat. *divinare*, to see like a god). Quest or discovery of the unknown by non-rational processes. The knowledge thus sought or obtained may be the identity of wrongdoers; the right choice of persons, places, things, or acts; the whereabouts of persons or of desired things; the fate of persons in health or sickness; the divine will; or future events.

Divination by omen may be deemed to have sprung from the disposition to regard two consecutive events as standing in the relation of cause and effect. Arising in that early atmosphere of thought which is called magico-religious, it is associated with the principle of sympathetic magic. When the conception supervened of divine beings capable of being propitiated, the magician, the master of the supernatural, passed into the diviner, their servant. Divination thereupon came to imply, consciously or unconsciously, an appeal for guidance, and in some communities was formally recognized.

At the dawn of recorded history divination controlled the public and private life of W. Asia. Early Sumerian practices, taken over and developed by Semitic Babylonia, became a complex system which afterwards affected the religious usages of ancient Greece and Rome. These practices drifted to early China, where oracle-bones from Homan are datable before 1200 B.C., as well as to Vedic India, and close parallels are recorded in ancient Mexico and Peru. Babylonian methods—three occur together in Ezek. 21—profoundly influenced Jewish usage.

In the stricter sense divination is subjective or intuitive. It is a mode of "seeing like a god." It makes use of (1) dreams; (2) autohypnotism; (3) subconscious impression; (4) necromancy. Its highest manifestation is the oracle. Dreams are either involuntary or purposely sought by crystal-gazing

and the like. Autohypnotism includes trance and frenzy; the subconscious includes the phenomena of clairvoyance, divining rods, and planchette.

In a wider sense it embraces various objective processes involving empirical deductions from observed facts. These facts are regarded as omens, whose interpretation may be undertaken by the lay observer, explained by published books, or dependent upon the services of professional diviners, such as the school of augurs in ancient Rome and Mexico. They are sometimes conceived as supernatural signs or portents, sometimes as events shown by experience to be habitually followed by others. These objective processes include the observation of (1) living things, as in augury and palmistry; (2) dead things, as in haruspicy, the inspection of entrails, and scapulomancy, that of shoulder-blades; (3) physical objects, as in astrology, geomancy, and the behaviour of sand, fire, or water; (4) magical mechanisms, as suspended rings, keys, or sieves; (5) the consultation of books at random—Virgil, the Bible; (6) the casting of lots.

Almost all these methods survive in primitive culture or in popular superstition. The flight and song of birds are noted in Borneo, the movements of lizards and insects in Torres Straits. Fowls are slaughtered by the Nagas and Kavirondo; livers are inspected in Borneo; chicken-bones in Burma. The Barotse use knuckle-bones, the Borneo Kayans bears'-teeth dice, the Polynesians coconut tetotums. *See Magic; Prophecy; Soothsayer.*

**Divine Right.** Political theory that all authority has a divine sanction, and that the sovereign power does not exist merely by the will of the people or the consent of the government. The doctrine that a monarch exercises his power by inherited right and not in virtue of any contract, actual or implied, with his people, grew up under the Tudors in the 16th century, and the tact of Elizabeth enabled it to pass without serious challenge.

It was, however, during the reigns of James I and Charles I that it was most in evidence. Both the kings and the ecclesiastics welcomed it, and arguments in its support were taken from the Bible. The clash between it and the ideas held by the parliamentarians was the fundamental cause of the Civil War. The establishment of William and Mary upon the throne in 1688



Diving. 1. Fully equipped deep sea diver with air pump and telephone. 2. Diver ready to go down. 3. Underwater lamp. 4. Swim-suit ("frog-man")

*Courtesy of Siebe, Gorman & Co., Ltd.*

was a rude shock to the theory of divine right, while the accession of the Hanoverian dynasty in 1714, with a title based on a definite parliamentary act of settlement, rendered it untenable by supporters of George I. The chief exponent of divine right in England was Robert Filmer, while it was preached in France by Bossuet. *See Sovereignty; consult also Theory of the Divine Right of Kings, J. N. Figgis, 1896.*

**Diving.** Descent under the sea, during which the diver is submerged for a prolonged period and for which artificial aids are neces-

sary. Salvage work, harbour and dock construction and maintenance, and all work of an underwater character are dependent on the modern "dress" diver. The diving-dress used universally today is the "closed" dress, so called because the diver is totally enclosed, except for his hands, in a water-tight dress and helmet supplied with air from the surface by pump or air-compressor and air-line. The first "closed" dress was introduced in 1837 by Augustus Siebe (1788-1872) and on it the present-day dress is based. This comprises: (1) The dress proper, made of sheet indiarubber, interposed between and affixed to two layers

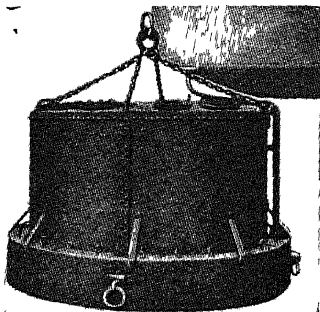
of stout tanned twill. The only openings are at the wrists, which are provided with cuffs of vulcanised rubber compressed by stout external rubber rings, and at the top. (2) The corselet, of tinned copper, between the lower edge of which and an external metal strap the neck of the dress is clipped by nuts and bolts. There are two hooks, back and front, from which leaden weights are suspended. The corselet has a circular neck with interrupted screw threads cut on the outside to engage with similar threads on the inside of (3) the helmet, of stout beaten copper,

provided with a removable circular glass window in front, and a fixed window in each side, and in some types a top window, a non-return air inlet valve at the back, and an air escape valve at the right side. If telephonic communication is used, a receiver is fitted in the crown, a transmitter to the right of the front of the glass, and a switch, pressed by the diver's chin, beneath the glass. (4) The leaden breast and back weights, 40 lb. each. (5) Boots, weighted with lead or brass, scaling 30 lb. or more. (6) A lifeline, used for raising and lowering the diver, and for signalling. (7) A length of flexible wire-lined rubber tubing with metal couplings. (8) A hand-driven air-pump or an oil engine or electrically-driven air-compressor which forces air from above through the tube and inlet valve into the helmet.

When dressed to descend the diver carries some 170-200 lb. He regulates the air escape valve so that the air-pressure inside the dress is slightly above that of the water outside, and air escapes freely in a continuous stream, while keeping the dress sufficiently inflated to displace almost the weight of diver and equipment.

For special purposes, self-contained apparatus rendering the diver independent of surface air supply can be used. This mostly embodies the self-regenerative breathing circuit by which compressed air and oxygen are supplied to the diver from cylinders carried on his dress, and his exhaled breath is purified of carbon dioxide by passing it through a suitable absorbent. He thus breathes the same air several times over. This system was designed in 1878 by H. A. Fleuss in association with Siebe, Gorman & Co., Ltd., and improved later by Fleuss in collaboration with R. H. Davis. Many types of self-contained dresses were used during the Second Great War, by crews of midget submarines, "human" torpedoes, etc. For short periods of immersion such as in the escape from sunken submarines the Davis submarine escape apparatus is used by the Royal Navy. (See Submarine.)

To increase the depth to which divers can with safety descend is a problem to which much experiment is devoted, and experiments have been made with aluminium suits which allow descent to greater depths. The limiting factor is the danger to the diver of compressed air illness, caused by the formation of nitrogen bubbles in the system,



Diving Bell. The ordinary, or Smeaton, diving bell  
*Siebe, Gorman & Co., Ltd.*

should he change from the high pressure of deep water to lower pressure too quickly. Adherence to decompression tables, by which the diver is brought to the surface in specially calculated stages at each of which he waits for specific periods, enables him to return to normal pressure slowly. The safe limit of depth has been taken over 300 ft.; with mixtures of oxygen with hydrogen, helium, or nitrogen for supplying the diver, greater depths have been attained. If he has been under water 12 minutes at 200 ft., where the pressure is 89 lb. per sq. in., he will require 32 minutes for his ascent. To reduce the discomfort to the diver in cold water, the Davis submersible decompression chamber was introduced; this is lowered to a certain depth at which the diver enters the chamber, removes his heavy gear, and decompresses in comparative comfort. *Consult Deep Diving and Submarine Operations, Sir Robert Davis, 1936.*

**Diving.** Act of plunging into the water. One of the most useful methods, especially for racing purposes and for diving into shallow water, is the straight forward plunge, in which the body is hurled head foremost from a position almost level with the water, at a very little depth beneath the surface for a distance of some 30 ft.

The plain header, a straight dive, head first from some height, with the legs in the air and carrying the diver down a considerable distance before the hands are turned upwards to enable the body to rise to the surface, should be attempted only in a depth of at least 10 ft. of water, in which there are no weeds. Jumping into the water in an upright position, legs first, is a favourite way with many swimmers, and is easily acquired, but is not strictly diving. Though appearing easy and graceful when executed by a thoroughly compe-

tent exponent, these feats, especially that of throwing a backward somersault into the water, are exceedingly dangerous for the novice. The swallow dive, a jump from a height of 40 ft. to 50 ft., with the arms outstretched at right angles to the body, is a graceful variety. *See Swimming.*

**Diving Bell.** A steel open-bottomed chamber used for underwater work in dock and harbour construction, the building of piers and jetties, etc. The "bell," usually of rectangular shape, is very heavy, so that it sinks down through the water. Water is excluded by air forced in under pressure. Around the sides of the bell, within, are seats for the workmen who descend in it. Lifting tackle is attached to the roof, by which blocks of stone, etc., can be hoisted and lowered on to the bed prepared for them on the foundations of the structure being erected. The bell is lowered, hoisted, and moved along by means of a crane on a barge, or on the staging or jetty. A telephone provides communication.

John Smeaton employed a diving bell for the Ramsgate harbour works in 1784. His bell was a rectangular wooden one, strengthened with iron, and accommodated two workmen. Nineteen years later John Rennie, in charge of repair work at Ramsgate, designed a cast iron diving bell about 6 ft.  $\times$  4½ ft.  $\times$  6 ft. high, having a number of heavy bull's-eye windows in the top. The weight was about five tons, ten times that of Smeaton's primitive appliance. *See Caisson; Diving.*

**Divining Rod.** Twig used in "dowsing" or searching for subterranean springs of water or veins of ore. The dowser holds a forked twig in his hands, which on approaching the hidden water or metal twists and sometimes breaks. The practice has been in use from early times for locating a wide variety of substances. In the majority of tested cases the results have proved entirely negative, but a few dowsers are too often successful for the phenomena to be ascribed to chance or coincidence. The twisting is said to be due to the effect of the neighbourhood of water or metal on certain sensitive constitutions. Dr. J. W. Gregory, F.R.S., considers that the survival of dowsing in the search for water is because shallow supplies of water are scattered abundantly but irregularly, and water diviners are quick to detect faint surface indications.

**Divinity.** Word meaning the essence of God, applied by theologians in various senses. It is commonly used as a synonym for theology, in the sense of the science of divine things, including the nature and attributes of God, the principles of His government, and the relations of man with God, and his consequent duty to Him. It is also used of the Divine Being and of the minor deities of polytheistic systems. See God; Theism.

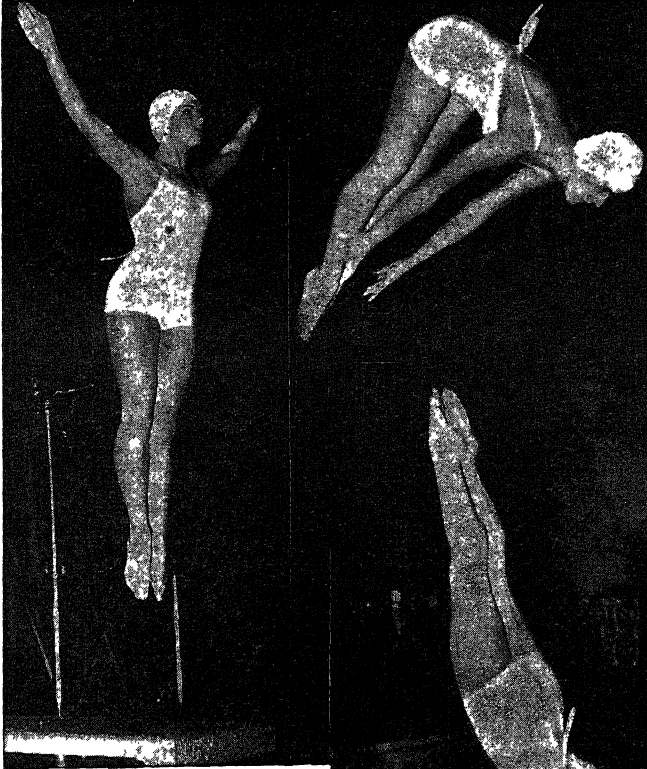
**Divisibility.** In mathematics,

In both houses of parliament the act of voting is known as a division. At such times, announced by the ringing of a bell, strangers withdraw and the doors are closed. The members then divide, *i.e.* pass into one or other of the two division lobbies—ayes to the right, noes to the left—where their names are taken by two members known as tellers. The number that has passed through each lobby is then counted and the result announced.

**Division.** In the military

sense, a division is the unit of troops between an army corps and a brigade. Its strength varies from 12,000 to 20,000 men, dependent upon whether it is an armoured or infantry division. A division is the normal command of a major-general and has three brigades, with its own artillery, engineers, and supply services. Normally it is the largest unit in which British troops are organized; but in warfare the usual practice is to form three divisions into an army corps. During the Second Great War it was usual to calculate the strengths of the various combatants in divisions. In the Royal Navy, the term division is applied to a group of four or more warships. The Royal Marines have divisions based on Portsmouth, Plymouth, and Chatham.

**Divisions.** Musical term used in the 17th and 18th centuries to denote what are now called variations (*q.v.*). It referred especially to those of a quick nature, in which the notes of the original theme were divided into a larger number of shorter notes. Divisions on a ground meant a series of such variations built up over a recurring bass theme or phrase; they were a favourite diversion of performers on the viols (*q.v.*) and were sometimes extemporised. The long runs of semi-quavers in such songs as Let the Bright Seraphim and Rejoice Greatly by Handel may be called divisions.



the property by which a larger number contains a smaller an integral number of times.

In physics the term divisibility arose from the semi-metaphysical conception of the atom, an atom of matter being theoretically a particle so small that it was not susceptible of further division. But with the development of the theory of electrons it became no longer even theoretically sound to speak of an atom of matter as indivisible.

**Division.** Word used in several senses. In a political sense it is used in the United Kingdom and other parts of the British Empire for an electoral area that sends a member to the house of commons.

Diving. Four stages in making a straight dive from a springboard, demonstrated by a graceful exponent of the art. See text in facing page

## DIVORCE: LAW AND PROCEDURE

*An explanation, contributed by a legal expert, of the terms and working of the Matrimonial Causes Act of 1937, in England and Wales, is followed by a survey of divorce laws in other parts of the world, including the U.S.A.*

Power was first given to the courts in England and Wales to pronounce a divorce—i.e. dissolve or put an end to an existing marriage—by the Matrimonial Causes Act, 1857, which set up the modern divorce court. Jurisdiction in matrimonial matters had previously been vested in the ecclesiastical courts, but these courts could not dissolve a marriage although they could grant decrees of nullity—i.e. declare there never had been a marriage—and also grant decrees which had the effect of a judicial separation. Before 1857 a divorce could be obtained only by a private Act of parliament. From 1857 to 1923 a husband could divorce his wife for adultery, but a wife could not divorce her husband unless she could prove in addition to adultery some offence such as cruelty or desertion. The law of divorce was revised by the Matrimonial Causes Act, 1937, under which a divorce can be obtained by either a husband or a wife on proof of (a) adultery; (b) desertion for at least three years; (c) cruelty; (d) the fact that the person against whom the proceedings are taken is incurably of unsound mind and has been continuously under care and treatment for at least five years immediately before the presentation of the petition. The act of 1937 did, however, introduce one important new limitation: no petition can be presented in the first three years of marriage unless in the opinion of the court exceptional hardship is involved for the petitioner or exceptional depravity on the part of the respondent. In divorce and other matrimonial cases, the proceedings never go by default. Thus, the petitioner must prove the facts necessary to entitle him (or her) to a decree even though the other party does not defend the proceedings.

**ADULTERY.** Where the ground of the petition is adultery the confession of the party accused may be accepted by the court as sufficient, but as a general rule the court wants corroboration.

**DESERTION.** No comprehensive definition of desertion has ever been laid down. The mere fact that husband and wife live separately is not sufficient, since

they may have to do so because of the husband's work. On the other hand, in exceptional cases there has been held to be desertion even where husband and wife have continued to live in the same house if it could be shown that one or other has deliberately severed the common home. Again, as a general rule a wife is bound to live with her husband if he offers her a suitable home at the place of his choice, and if she refuses to accept such a home she deserts him. There is no desertion if the party alleged to be deserting had in fact a good ground for leaving the other (for instance, where a husband leaves a wife who has confessed to adultery), but the ground must be "grave and weighty." Drunkenness, for example, is not normally considered sufficient.

As desertion must be against the will of the deserted party it follows that if husband and wife have agreed to separate and live apart neither can afterwards complain of that original separation as being desertion (although in certain exceptional circumstances where a husband and wife have separated by agreement either may nevertheless later desert the other, as where both have repudiated the agreement). Similarly, when a wife has obtained in a magistrate's court a separation order against her husband which contains a clause that they shall not live together, such an order ends any desertion there may have been, since a wife cannot complain that her husband is deserting her when she has applied for and obtained from the court an order prohibiting him from living with her.

**CRUELTY.** When the petition gives cruelty as a ground for divorce the law requires that there should be some real or apprehended injury or danger to bodily or mental health. There is a popular impression that mental cruelty is not sufficient, but the true test is not whether the cruelty is physical or mental but whether it causes, or may reasonably be expected to cause, injury to health. Persistent nagging may be enough, and an act which would not of itself be sufficient may become sufficient if repeated many times or if followed by other acts.

**INSANITY.** When insanity is the ground, it must be proved that the insanity is incurable and that the respondent has for at least five years immediately before the petition been a patient in a mental hospital.

Where the ground of the petition is adultery, no divorce can be obtained if there has been connivance, condonation, or collusion; nor, where the ground of the petition is cruelty, if the cruelty has been condoned. In certain other cases, the court has a discretion to grant or dismiss a case: for instance, if the petitioner has been guilty of adultery, unreasonable delay in presenting the petition, or cruelty, whatever the ground of the petition; if the petitioner has been guilty of desertion, wilful separation, or cruelty, where the ground of the petition is adultery or cruelty; or if the petitioner has been guilty of such wilful neglect or misconduct as to conduce to adultery, unsoundness of mind, or desertion, where the petition is on these grounds.

At one time the court would rarely grant a divorce where the petitioner had been guilty of adultery, but today the court does so more often, taking into account matters such as the interests of society, which, on the one hand, require that the marriage tie should be respected, but, on the other hand, make it undesirable to refuse to terminate a marriage that has completely broken down. The court also considers how any children of the marriage will be affected and whether there is any prospect of marriage between the petitioner and the person with whom he or she admits adultery. If, however, the petitioner has to ask the court to exercise its discretion in his or her favour on the ground of adultery, it is absolutely essential that full disclosure of the facts should be made at an early stage in the proceedings. The facts are set out in writing in what is called a "discretion statement" and this is kept in a sealed envelope until required.

**NULLITY.** Whereas a decree of divorce assumes that the husband and wife were validly married and puts an end to the marriage as from the date of the decree, a decree of nullity is a declaration that two persons who may have considered themselves husband and wife were never in fact validly married at all. Before 1937 marriages could be annulled only if the persons were



within the Prohibited Degrees (*q.v.*) of relationship; or if one of them had not at the time of the marriage reached the age at which marriage is legally possible (16 since 1929); or if one of them was already married to someone else; or if there was no proper consent to the marriage as, for example, because one of the parties was of unsound mind; or where the marriage was celebrated without some necessary formality—*e.g.* the banns were not properly published—or where one of the parties was incapable of consummating the marriage. The Matrimonial Causes Act, 1937, however, added several new grounds of the greatest importance, and now, while these earlier grounds still remain, a marriage may in addition be annulled (*a*) where it has not been consummated because of the wilful refusal of the respondent; (*b*) if either party was at the time of the marriage of unsound mind or a mental defective or subject to recurrent fits of insanity or epilepsy; (*c*) where the respondent at the time of the marriage was suffering from venereal disease; or (*d*) was at that time pregnant by some person other than the petitioner. In cases (*b*), (*c*), and (*d*) the petitioner must have been ignorant of the facts at the time of the marriage, the proceedings must have been started within a year of the marriage, and there must have been no marital intercourse since the facts were discovered.

**JUDICIAL SEPARATION.** A judicial separation does not end the marriage. It merely puts an end to the obligation of the husband and wife to live together. Thus the parties are not free to marry again. Further, the wife remains a wife and on her husband's death becomes his widow if she survives him and is entitled, if he has not made proper provision for her in his will, to apply to the court for reasonable maintenance out of his estate under the Inheritance (Family Provisions) Act, 1938. A decree of divorce or nullity destroys this right. A judicial separation can be obtained on any ground on which a divorce can now be obtained or where a decree for the restitution of conjugal rights has not been obeyed. Where a decree of judicial separation has been obtained or a separation order made in the magistrate's court on grounds on which a divorce might have been obtained, a petition for divorce may later be presented and the court

may treat the decree of judicial separation or the magistrate's order as sufficient proof of the adultery, desertion, or other ground on which it was granted, and grant a divorce accordingly.

**RESTITUTION OF CONJUGAL RIGHTS.** When without proper cause a wife leaves her husband, or a husband leaves his wife, the party aggrieved may take proceedings for restitution of conjugal rights. When a decree is made, the party obtaining it cannot by force compel the other to obey it, and such proceedings are today rarely taken and of little importance. Until 1923 they were valuable in that a wife could obtain a divorce if she could prove that her husband had committed adultery and had in addition failed to obey a decree of restitution. Since 1923, however, it has been unnecessary for her to prove anything more than adultery.

**ALIMONY AND MAINTENANCE.** Alimony is the provision which the court orders the husband to make for his wife when there is a marriage subsisting. Maintenance is the provision a man is ordered to make for his ex-wife after a marriage has been ended by divorce obtained by the wife, or has been annulled. While any matrimonial proceedings by a wife are pending, whether for divorce, nullity, or judicial separation, a husband may be ordered to pay alimony *pendente lite*. After judicial separation he may be ordered to pay permanent alimony. Alimony *pendente lite* is usually such sum as will bring the wife's income up to one fifth of the joint income of husband and wife, and permanent alimony is usually such sum as will bring the wife's income up to a third (sometimes a half) of the joint income. The amount of maintenance may also be a third of the joint income, but in none of these cases is there a fixed rule. A husband may be ordered to pay permanent alimony after a decree of judicial separation, even though he was the petitioner and obtained the decree, but apart from some exceptional cases, as where a husband obtains a divorce on the ground of his wife's insanity, a husband cannot be ordered to pay maintenance to a wife when it is he who has obtained the divorce. Where a wife divorces her husband on the ground of his insanity she may be ordered to pay him maintenance, and where a man obtains a nullity decree he may be ordered to maintain his "wife."

**DAMAGES.** A husband may in proceedings for divorce or for judicial separation on the ground of adultery claim damages against the man who has committed adultery with his wife—that is, the co-respondent. The wife, however, has no similar claim against a woman who has committed adultery with her husband. The amount of the damages cannot of course be calculated in accordance with any exact rule. They are designed to compensate a husband for the loss of his wife and for the injury to his feelings.

**DECREES.** Under the Act of 1857, divorces were absolute when pronounced. An Act of 1860 made a change in the proceedings for divorce and nullity by which a decree nisi is first made. This does not end the marriage, which continues until the decree absolute. A decree absolute is not made automatically, but must be applied for by the petitioner at any time after six weeks from the decree nisi. (The period of waiting was six months up to August, 1946.) If the petitioner does not apply within three months of first being entitled to do so, the respondent may apply. It is only on the decree being made absolute that the marriage comes to an end.

**KING'S PROCTOR.** The King's Proctor may intervene in divorce or nullity proceedings to oppose the making of a decree, at any time before the decree absolute, and his most usual ground for doing so is that the proceedings have been collusive. A private person may likewise intervene.

**JURISDICTION.** All matrimonial causes may be heard either in the Probate Divorce and Admiralty Division of the High Court in London or at Assizes. Apart from certain exceptional cases, no divorce can be obtained in England unless the husband and wife are domiciled in England at the time of the proceedings. Domicile may differ from residence, and in general a person is domiciled either in the country in which he was born or, if he has left that country, then in the country in which his permanent home is situated. A wife takes the domicile of her husband, so that if a woman domiciled in England marries a man domiciled elsewhere, or if a man who at the time of his marriage was a domiciled Englishman changes his domicile, the wife cannot obtain a divorce in England. This caused hardship in cases where a man deserted his wife and went abroad permanently, so changing his domicile, and in



1937 it was made possible in such cases, and also where the husband was deported from the United Kingdom, for a wife to obtain a divorce in this country. Still greater difficulties arose during the Second Great War when British women married members of the Allied forces stationed in this country, or other foreigners domiciled abroad, and it was specially provided by the Matrimonial Causes (War Marriages) Act, 1944, that as a temporary measure a decree of divorce or nullity in respect of such marriages might be obtained in England (or Scotland) if the marriage took place on or after September, 1939, the husband being at that time domiciled outside the United Kingdom and the wife being at that time domiciled in England (or Scotland). If, however, husband and wife had since the marriage lived together in the country in which the husband was domiciled, the right to bring proceedings in England or Scotland was lost. It should be noted that the provision that no divorce petition could be presented within three years of the marriage did not apply to marriages which come within this Act.

**CHILDREN.** The court may make provision for the custody, maintenance, and education of the children of the marriage where there are proceedings for divorce, nullity, or judicial separation. As a general rule, the custody of the children will not be given to the guilty party in the proceedings; but the first and paramount consideration is the welfare of the children. The party deprived of the custody may, however, be given access to the children. When a child reaches the years of discretion, that is, usually, 16, the court will take into account the wishes of the child.

**PRESUMPTION OF DEATH.** Under the Matrimonial Causes Act, 1937, the court may presume the death of either husband or wife and dissolve the marriage. The fact that the party whose death it is desired to presume has been absent from the petitioner for seven years, and the petitioner has no reason to believe the other party has been alive within that time, is evidence of death until the contrary is proved; but even before that time death may be presumed if there are facts making it likely that death has taken place. If, after a decree has been made absolute, it is found that the person thought to be dead was in fact alive, the dissolution of the marriage nevertheless holds good.

**SCOTS LAW.** Before the Divorce (Scotland) Act, 1938, divorce could be obtained in Scotland for adultery or desertion for four years, but since that Act the grounds are substantially the same as in England. The restriction in English law, that no divorce proceedings can be taken until three years after marriage, does not apply in Scotland. The new grounds for nullity, introduced in England in 1937, likewise do not apply in Scotland. The provisions enabling the death of a husband or wife to be presumed and the marriage dissolved apply in Scotland also. Subject to the Matrimonial Causes (War Marriages) Act, 1944, proceedings for divorce can be taken in Scotland only if the parties are domiciled Scots. In Scotland there are not two decrees, one nisi and the other absolute, as in England, but one decree only. Upon divorce, except on the ground of insanity, the guilty party loses all rights to succeed to property of the other party, and the innocent party can claim these rights just as though the guilty party were dead.

**IRELAND** (both Eire and N. Ireland) has no absolute divorce, but the courts may grant a divorce *a mensa et thoro* (i.e. a separation); and a petitioner may secure a dissolution by act of parliament.

**DOMINIONS.** In Canada, exclusive authority to legislate on divorce was conferred on the dominion parliament by the British North America Act of 1867. As the dominion parliament has passed no act, there is no complete divorce in Alberta, Manitoba, Ontario, Quebec, or Saskatchewan, except by act of the dominion parliament. British Columbia, New Brunswick, Nova Scotia, and Prince Edward Island retain the divorce laws they had before federation. There is no divorce in Newfoundland.

Grounds for divorce vary in the states of Australia, but on the whole are wider than in Britain. New Zealand admits adultery; wilful desertion for five years; habitual drunkenness for four years, plus cruelty or desertion by the husband, neglect of household duties by the wife; seven years' penal servitude; incurable lunacy for at least 10 years. South Africa follows Roman Dutch law, allowing divorce for adultery, unnatural offences, malicious desertion, and lifelong imprisonment.

**EUROPEAN CONTINENT.** Italy, Spain, and Portugal, being Roman Catholic countries, do not allow

absolute divorce, but only divorce *a mensa et thoro*. Roman Catholics in these countries, as elsewhere, can in certain circumstances secure a papal dispensation of nullity of marriage (see Dispensation). Italy does not recognize foreign divorces of Italian subjects. Belgium allows divorce by mutual consent, on account of the adultery of the wife, adultery by the husband only if he has brought a concubine into the marital home, cruelty, conviction for infamous offences; an interval of three months must elapse before remarriage. In the Netherlands, divorce is allowed for adultery, wilful desertion for five years, unnatural offences, life imprisonment, absence for 10 years; the court sits in private, and makes efforts to dissuade husband and wife from seeking divorce. In Sweden, divorce is granted after the expiry of a year from the date of a judicial separation on the grounds of aversion, for adultery, six years' absence without news, conduct endangering life, imprisonment for life. In France, a law of Sept. 20, 1792, virtually terminated the obligations of marriage. Divorce was made easy under the code Napoléon, abolished on the restoration of the monarchy in 1816, and reintroduced in 1884. The grounds are adultery, violence or cruelty, serious moral and social offences of one partner against the other, condemnation to an infamous penalty of either spouse, mutual determination to separate persisted in for three years and established to the satisfaction of the court; publication of divorce proceedings in the press is forbidden.

In Russia, marriage and divorce were treated very laxly for a time after the revolution of 1917, but regularity was soon reintroduced, mutual consent and an appearance before the official who registered the marriage being at first sufficient to secure divorce. Subsequently the spouse asking for divorce had to establish a true case before a court, and by a law of June 27, 1936, the tax on divorce was augmented to 50 roubles for the first, 150 for the second, 300 for the third and subsequent decrees.

Under Muslim law, a wife can never divorce her husband, though she can take steps to secure the dissolution of her marriage; the husband can repudiate his wife at will. In Palestine, divorce matters are governed by the religion to which the parties belong, and any divorce granted must be secured

through and registered by the appropriate religious authority.

**UNITED STATES OF AMERICA.** When the United States, on achieving her independence, incorporated in her legal system the common law of the mother country, she made an exception in the case of divorce, for she established no ecclesiastical courts, such as were alone competent at that time to deal with this question in England. The granting of divorce has therefore been from the first within the jurisdiction of secular courts only. Divorce, like marriage, is regulated under the constitution by state, not federal, laws, with consequent great diversity of practice. South Carolina granted divorces only from 1949. Everywhere the primary cause is adultery, which in New York is the sole cause allowed. Among other causes recognized in different states are pregnancy of wife by other than husband at time of marriage (the husband being then unaware of the fact), impotence if unknown at time of marriage, desertion for a period varying from one year to five years, insanity, cruelty ranging from "contumelious words accompanied by a contemptuous demeanour" to physical violence endangering life, neglect to provide for a wife, and incompatibility of temperament. In the Philippines adultery is the only cause for divorce; in Hawaii six months' desertion is sufficient.

Jurisdiction is based on the domicile of the parties. The usual period of residence within a state required by its law is one year, but in Idaho and Nevada it is as little as six weeks, and in Massachusetts as much as five years. In 1945 the supreme court ruled that each state has the right to decide whether the six weeks' residence under which Nevada grants divorces constitutes a legal domicile, and consequently upheld the refusal of a N. Carolina court to recognize a Reno divorce.

Bills have been introduced into congress proposing a constitutional amendment that would empower that body to enact a national divorce law. They have made little headway, mainly because any uniform law would be too lax to satisfy public opinion in some states and too strict in others.

**Dix, JOHN ADAMS** (1798-1879). American diplomatist, statesman, and soldier. Born at Boscawen, New Hampshire, July 24, 1798, he served in the army and then practised as a lawyer. He became a member of the senate, 1845-49,

and secretary of the treasury, 1861. He rendered good service in the Civil War, and helped to suppress the riots in New York, July 13-16, 1863, against conscription.

Minister to France, 1866-69, and governor of New York, 1873-74, he died April 21, 1879. *Consult* Memoirs, ed. by his son Morgan, 1883.

**Dixcove.** Small port of the Gold Coast, W. Africa. It is in the W. province, 10 m. N.E. of Cape Three Points. There is an old fort, situated on high ground overlooking the harbour, commenced by the English in 1691.

**Dixie.** Popular name for the southern states of the U.S.A. Its origin is doubtful. Some consider it a corruption of Dixon, the joint surveyor of the Mason and Dixon line. Others derive it from a currency note issued by a Louisiana bank. This was for \$10, and contained a large "Dix" in the centre of its reverse side. Hence Louisiana, and later the whole south, became known as the Land of Dixies. The name gained vogue through an inspiring song, "Away Down South in Dixie," composed in 1859 by D. D. Emmett, a member of a troupe of coloured minstrels; this served during the Civil War as a Confederate national anthem.

**Dixie, LADY FLORENCE CAROLINE** (1857-1905). British traveller and writer. Born in London, May 24, 1857, the youngest daughter of the 7th marquess of Queensberry, in 1875 she married Sir Alexander Beaumont Dixie. Her travels in Patagonia, 1878-79, were the subject of an interesting volume, *Across Patagonia*, 1880. In the Boer War of 1880-81 she was war correspondent for *The Morning Post*, and in 1882 published her experiences, *In the Land of Misfortune*. The same year appeared *A Defence of Zululand and its King*. She died Nov. 7, 1905.

**Dixmude.** Town of Belgium, in the prov. of W. Flanders. It is on the river Yser, 12 m. N. of Ypres, 42 m. W. of Ghent. The chief buildings are the church of S. Nicholas, with some valuable works of art, and the town hall. Early in the First Great War there was much fighting around Dixmude, the Germans entering it on Nov. 10, 1914. The town was again prominent in the second battle of



John Adams Dix, American statesman

Ypres, 1915, and was captured by the Belgians, Sept. 29, 1918. *See* Ypres, Battles of; Yser, Battle of the.

**Dixon, WILLIAM HEFORTH** (1821-79). British traveller and historical writer. Born in Manchester, June 30, 1821, he was editor of *The Athenaeum*, 1853-69. He travelled widely in Europe, the East, and the U.S.A., and contributed to the foundation of the Palestine Exploration Fund. *New America* (1867) was his most successful travel book; and *Her Majesty's Tower*, 1869-71, and *The History of Two Queens* (Catherine of Aragon and Anne Boleyn), 1873-74, his chief historical works. He died Dec. 27, 1879.

**Dixon Entrance.** Strait separating Prince of Wales Island, Alaska, from Queen Charlotte Island, British Columbia. In length 100 m., with a maximum breadth of 70 m., it is noted for its scenery. It was discovered c. 1785 by G. Dixon, an English navigator.

**Dizful.** Town of Persia, in the prov. of Khuzistan. It stands on the Diz river, 32 m. N.W. of Shuster, and is noted for its mosques and bridge of 22 arches. There is trade in indigo, and the town is the chief mart of the prov. Pop. 15,000.

**Djakarta.** Alternative form of Jakarta, name given in 1949 to Batavia. *See* Batavia.

**Djakova.** Alternative spelling of the Yugoslav town Jakova (*q.v.*).

**Djemal Pasha, AHMED** (1861-1922). Turkish politician and soldier. Born at Istanbul, of obscure origin, May 1, 1861, he became minister of marine in 1914, and in 1915-17 led Turkish forces in Sinai and Palestine. His cruelties in Syria led to the shereef of Mecca assuming the title of king of the Hejaz in 1917. On the collapse of Turkey in Oct., 1918, Djemal Pasha fled. Accused of misappropriation of state funds and of crimes against international law, he was condemned to death in his absence in July, 1919. Turkish peace delegate at Paris in 1920, he was assassinated at Tbilisi, on July 22, 1922.

**Djezzar, AHMED** (1735-1804). Pasha of Acre. Born in Bosnia, he was sold as a slave to Ali Bey, who employed him as an assassin, hence his surname of Djezzar, the butcher. He escaped from Egypt in 1773, and became governor of Beirut, and afterwards pasha and vizier of Syria. In 1791 he was deprived of office, but was restored, and when Bonaparte invaded Syria, rejected the conqueror's overtures, and in cooperation with

Sir Sidney Smith defended Acre in 1799. Three years later he made peace and received Napoleon's envoy.

**Djibouti** OR DJIBBAH. Alternative spellings for the seaport and capital of French Somaliland, also spelled Jibuti (*q.v.*).

**Djubbah**, DJIBBAH, OR JUBBAH. Long, simple cloak-like garment worn by the Arabs.

**Dmitrov**. Town of R.S.F.S.R., in the region of Moscow. It stands on an affluent of the Volga, 45 m. N. of Moscow, and trades in grain and vegetables. There are leather, cloth, and soap factories, and tanneries. At the standing market much business is done in Russian leather, sail-cloth, linen, and wax, and woollen, silk, and cotton stuffs.

**Dniester**. River of Russia, mainly in White Russia S.S.R. and Ukraine S.S.R. It rises in the Valdai plateau in the Western region of R.S.F.S.R., and is navigable almost from its source, although below Dnepropetrovsk navigation is much impeded by the famous *porogi* (rapids). It passes Smolensk, Rogachev, Kiev, Dnepropetrovsk, and Kherson, a little below which it falls into the Black Sea by a large estuary. Its chief tributaries are the Beresina, Pripet, and Desna. These rivers are obstructed by ice in the winter and suffer from drought in the summer, but are mostly navigable in the spring. The Dniester is of great importance for the conveyance of corn to Odessa. Its ancient names were Borysthenes and Danapris. Its length is 1,340 m.

In July-Aug., 1941, a great battle between the Russians and Germans raged in the Dniester bend for the possession of industrial Ukraine. The Russians withdrew E. of the river on Aug. 16, and the Germans captured Dnepropetrovsk on Aug. 27. The great Dniester dam was put out of action next day by the retreating Russians. On Sept. 14, 1941, the Russians evacuated Kremenchug, and the Germans crossed the lower Dniester.

The Russian summer offensive of 1943 swept the Germans back to the river, which the Russians began crossing on Sept. 25. On Oct. 17 they launched an offensive S.E. of Kremenchug. They retook Dnepropetrovsk on Oct. 25. Fighting within the river bend continued, until on Dec. 26 the Russians opened an offensive that drove the Germans back, and on Dec. 29 another attack began within the bend of the river, compelling

the Germans to evacuate eastern Ukraine.

**Dniester Dam**. A hydro-electric structure completed in 1932 under the Russian first five year plan to impound the waters of the Dniester and provide electric power for the tractor plants, steel mills, and aluminium factories established on the river. Ultimately the whole of the highly industrialised region of Krivoi Rog in the bend of the Dniester became dependent upon the dam for its power, which was also carried by transmission cables through a wide area of Ukraine S.S.R.

Built of reinforced concrete, the dam is  $\frac{1}{2}$  m. long and 200 ft. high. It impounds 291,800,000 gallons of water, and the seven turbines in the power station develop 900,000 h.p. to generate 540,000 kilowatts. The dam and power station form one of the largest electrical generating units in the world. To accommodate the personnel, a new town called Zaporozhe was built. The cost of the whole project totalled £25,000,000.

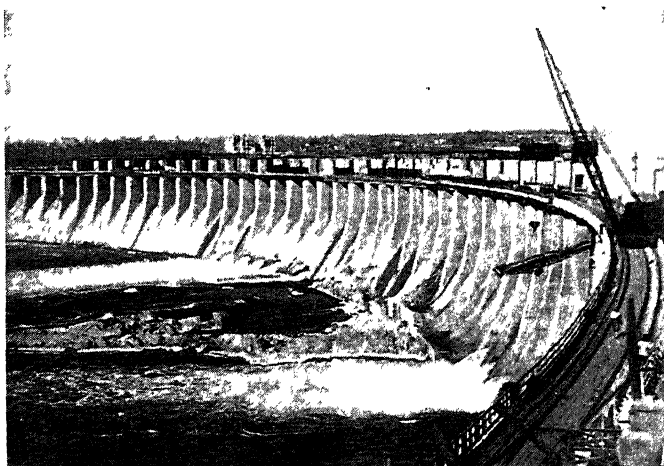
During the German advance into Ukraine the retreating Russians, in accordance with their "scorched earth" policy, breached this dam on Aug. 28, 1941. The Germans were able to repair the damage and made partial use of the power station until 1943, when they did further damage as they withdrew before the Russian offensive. Early in 1944 the Soviet government began reconstruction, and in March, 1947, the first of three 1,000-ton generators installed by a U.S. firm was put into action.

**Dneprodzerzhinsk**. Industrial town of Russia, in Ukraine S.S.R. It stands on the right bank of the Dniester, 20 m. W.N.W. of Dnepropetrovsk. Its fate in the Second Great War was practically the same as that of the bigger city, described below; it was occupied by the Germans on Aug. 27, 1941, and recaptured by troops belonging to the 3rd Ukrainian army on Oct. 25, 1943. Pop. 147,829.

**Dnepropetrovsk**. City of Ukraine S.S.R.; the capital of a province, and the eleventh city by pop. in the U.S.S.R. The pre-Revolutionary name was Ekaterinoslav (Catherine's glory). It stands on the Dniester near the beginning of the rapids, 250 m. N.E. of Odessa, with which it is the chief emporium for trading. It has rly. connexion with Kharkov and Kherson. General engineering and vast power stations provide the main employment. The town dates from 1786, when Potemkin built for the empress Catherine II a summer residence on the site of an old Polish fortress. Under the Soviet regime its pop. was more than doubled, reaching (1939) 500,662.

In April 1918 the town fell to the Germans. They captured it again in the Second Great War on Aug. 27, 1941. Dnepropetrovsk was liberated by troops of the 3rd Ukrainian army, who made the crossing of the river under cover of fog, Oct. 25, 1943.

**Dniester**. River of Ukraine S.S.R. and Moldavia A.S.S.R. Rising in the Galician Carpathians, it falls into the Black Sea, between



Dniester Dam. View taken during the reconstruction of the great dam in the Ukraine, first breached by the Russians in their scorched earth policy and later by the retreating Germans; it is half a mile long and 200 ft. high

the mouths of the Danube and the Dnieper. Much of its course of 750 m. forms the N.E. boundary of Bessarabia, which after the Second Great War was incorporated into the U.S.S.R. The Dniester is an important waterway for the conveyance of grain. Navigation is impeded, as on the Dnieper, by rocks, sandbanks, winter ice, summer drought, and rapids. Its valley is carved sometimes 500 ft. into the plateau, so that the towns lie along the valley edge. Its ancient names were Tyras and Danastris.

During the First Great War a battle was fought on the Dniester in June, 1915, between Austro-German and Russian armies. On June 1 the Russians were behind the line of the Dniester with bridgeheads on the further bank. The Austro-Germans forced a crossing on June 6, but were driven back on the 9th, and a second attack was also repulsed.

There was violent fighting along the line of the lower Dniester during the German thrust to Odessa in July, 1941, in the Second Great War. On July 19 German-Rumanian forces crossed the river at several points. Ten days later Rumanian troops reached the mouth, occupying Akerman. In March, 1944, the Russians opened offensives in Ukraine to clear that region and invade Bessarabia. The river was crossed on a 30-mile front by the 2nd Ukrainian army on March 19. Meanwhile the 3rd Ukrainian army had been driving the Germans from the Black Sea coast, retaking Odessa on April 10. There was then a lull on this front, but Akerman was liberated Aug. 23, the Dniester then being free throughout its course.

**Doab.** Name given in India to the land between two confluent rivers, but more particularly to the territory between the Ganges and Jumna, in the United Provinces. In this are situated Allahabad, Cawnpore, Etawah, Hathras, Meerut, Saharanpur. The Doab is irrigated by the Upper Ganges, Lower Ganges, and Eastern Jumna canals, and is the greatest wheat-producing area in the United Provinces. It is a stoneless alluvial plain.

**Dobbie, SIR JAMES JOHNSTON** (1852-1924). Scottish chemist. Born at Glasgow, Aug. 4, 1852, he was educated at its high school and at the universities of Glasgow, Edinburgh, and Leipzig. During 1884-1903 he was professor of chemistry in the university of North

Wales, then appointed director of the Royal Scottish Museum, Edinburgh. In 1909 he succeeded Thorpe as principal of the government laboratories, London, and in 1915 was knighted. He died June 19, 1924. Dobbie's original work was chiefly concerned with the constitution of

the alkaloids and the relation between the chemical constitution and the absorption spectra of organic compounds.

**Dobbie, SIR WILLIAM GEORGE SHEEDEN** (b. 1879). British soldier. He was born in Madras and educated at Charterhouse and the R.M.A., Woolwich. After serving in the South African and First Great wars, he was inspector of the Royal Engineers and commandant of

the school of military engineering, 1933-1935. Dobbie was appointed G.O.C. Malaya in 1935, and as lieutenant-governor and c.-in-c. of Malta, 1940-1942, retiring owing to ill-health. He was created K.C.B. in 1941. G.C.M.G. in 1942.

**Dobbin, MAJOR.** Character in Thackeray's *Vanity Fair*. Although a self-effacing, faithful friend, his sterling merit is overshadowed by his ungainliness and simplicity.

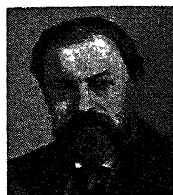
**Dobell, BERTRAM** (1841-1914). British bibliophile. Not until he was nearly fifty was he able to devote much time to literary pursuits, but he built up a bookselling business in Charing Cross Road, London, and a reputation as a bookman. He discovered and identified the works of Thomas Traherne, which he edited, 1903; edited the works of James Thomson (*Bysshe Vanolis*), 1895; wrote and published *Sidelights* on Charles Lamb, 1903; and edited the works of William Strode, 1907. He brought to light a MS. copy of Sidney's *Arcadia* (*q.v.*).



Sir James Dobbie,  
Scottish chemist  
*Elliott & Fry*



Sir William Dobbie,  
British soldier



Bertram Dobell,  
British bookman

In 1906 he issued a notable catalogue of privately printed books, and he was author of *A Century of Sonnets*, 1910. He died Dec. 14, 1914.

**Dobell, SYDNEY THOMPSON** (1824-74). British poet. Born at Cranbrook, Kent, April 5, 1824, he was the son of a wine merchant and was educated privately. His life, spent mainly in Cheltenham as a wine merchant, was varied by numerous visits to the Continent in search of health. His chief works are *The Roman*, 1850; *Balder*, 1854; and *England in Time of War*, 1856, which enjoyed great popularity. He died Aug. 22, 1874.

**Döbeln.** Town of Saxony, Germany. It stands on an island in the Mulde, 35 m. S.E. of Leipzig. It is a rly. junction, and has a number of manufactures, chiefly of various kinds of iron goods. Of its public buildings the church of S. Nicolas, a 15th century building, and the town hall may be mentioned. Pop. 22,560.

**Doberan.** Town and watering-place of Mecklenburg, Germany. It stands near the coast of the Baltic, 10 m. W. of Rostock, in the state of Mecklenburg-Schwerin. Its attractive surroundings and radioactive springs made it a popular resort. The chief building is a Gothic church dating from the 14th century and restored in the 19th century. There are a palace, owned by the former grand dukes of Mecklenburg, and the ruins of an abbey. About 4 m. away is Helligendamm, known for its bathing. Pop. 5,236.

**Dobritch, BAZARDJIK, OR BAZARJIK.** Town of Bulgaria, in Dobruja. It is situated on a small tributary of the Danube, about 28 m. N. of Varna, with which it is connected by rly. It is in that S. part of the Dobruja ceded to Rumania by Bulgaria after the second Balkan War of 1913 and restored in 1940. During the First Great War it was captured by the Bulgarians in Sept., 1916. Pop. 29,938.

**Dobruja, DOBRUDJA, OR DOBRUSCHA.** District of the Balkans, now divided between Rumania and Bulgaria. Called Dobrogea by the Rumanians and Dobritch by the Bulgarians, it is almost quadrangular in shape, and with an area of 8,969 sq. m. It is bounded W. and



Sydney Dobell,  
British poet

N. by the Danube, E. by the Black Sea, and S. by Shumen co. of Bulgaria. A considerable part of it consists of lagoon, marsh, and sandy plains, but in the fertile tracts agriculture is the chief occupation. From Cernavoda to Constanta it is traversed by a rly., from which near Megidia (Mejidie) a branch line runs S. to Dobritch (Bazardjik) and into Bulgaria. The only important town is Constanta; other towns are Tulcea, Babadag, Silistria, Megidia, and Dobritch.

In 1878 Southern Dobruja (2,956 sq. m.) was awarded to Bulgaria after the Russo-Turkish war of 1877-78, but after the second Balkan war in 1913 Bulgaria was compelled to cede it to Rumania. During the First Great War it was invaded and conquered by Mackensen in 1916. It was given to Bulgaria by the treaty of Bukarest, 1918, but at the final peace treaty was restored to Rumania. In 1940, after negotiations between Rumania and Bulgaria, the former ceded S. Dobruja to the latter. The new frontier followed that of 1912, running from just N. of Silistria on the Danube, to S. of Mangalia on the Black Sea. Pop. about 700,000. The inhabitants of the Dobruja are an extraordinary mixture of races and religions.

**Dobson, Frank** (b. 1887). British sculptor. Born in London, Nov. 18, 1887, he worked in the studio



Frank Dobson, British sculptor, at work in his studio

of Sir William Reynolds and later settled in Cornwall. Influenced by the Post-Impressionist exhibition of 1909, he built up a European reputation as one of the leading English sculptors. His bronze figure of Truth aroused much controversy when it was exhibited at the Leicester Galleries, London, 1930, but was bought for the nation and is now in the Tate Gallery. Dobson, who in 1923 became president of the London Group (*q.v.*) for four years, developed his work

along abstract lines, characterised by massive strength. He held one-man exhibitions at Bristol in 1940 and London in 1944, being made A.R.A. in 1942. See Art illus. p. 665.

**Dobson, Henry Austin** (1840-1921). British poet and essayist. He was born at Plymouth, Jan. 18,



*Aust Dobson*  
Russell

1840, and educated in England and in Strasbourg. From 1856 to 1901, when he retired, he served on the Board of Trade, becoming a principal clerk in 1884. In 1873 Austin Dobson published his first book of verse, *Vignettes in Rhyme*, followed by *Proverbs in Porcelain*, 1877; *Old World Idylls*, 1883; and *At the Sign of the Lyre*, 1885. In prose he wrote *Eighteenth Century Vignettes*, 1892-96; *Sidewalk Studies*, 1902; *A Bookman's Budget*, 1917. His fame rests more on *Lives of Fielding*, 1883; *Steele*, 1886; *Goldsmith*, 1888; *Horace Walpole*, 1890; *Hogarth*, 1891; *Richardson*, 1902; and *Fanny Burney*, 1903. He edited the *Diaries of Madame D'Arbly and Evelyn*. Echoing every quaint form of verse to be found in the old poets, ballade, rondeau, triolet, he was also closely familiar with 18th century literature. He died Sept. 2, 1921.

**Dobson, William** (1610-46). English painter. Born in London, he passed his early years in obscurity. He was then discovered by Van Dyck, whose pupil-assistant he became. On the latter's death in 1641, Dobson succeeded him as serjeant painter to the king, but after the Civil War became so poor that he died in a debtors' prison. His portraits of King Charles, Fairfax, and Sir Harry Vane may be cited.

**Doce** (Port. *Rio Doce*, sweet river). River of S.E. Brazil. It rises in the Serra do Espinhaço, Minas Geraes, flows N.E., curves S.E., and, traversing Espirito Santo, enters the Atlantic at Barra do Rio Doce; length, about 430 m. Its cataracts impede navigation.

**Docetism** (Gr. *dokein*, to seem). Early heresy which taught that the body of Christ was not real or material, but only an appearance. Like all forms of Gnosticism, it was based on the doctrine of the essential evil of matter. The body with which the Son of God clothed Himself could not therefore be one of

matter, and hence was not real but apparent. Some of the Docetae held that Christ's body was a mere phantasm, and others that it was substantial but not of material substance. The origin of this heresy is ascribed by some early writers to Simon Magus, but by others to Julius Cassianus, a disciple of Valentinus. As a necessary corollary, the Docetae denied the reality of the birth and crucifixion of Christ, while some rejected the union of His divine nature and human body in one personality.

**Dock** (*Rumex*). Genus of biennial and perennial herbs of the



Dock. Leaves and flowers of great water dock

family Polygonaceae. Natives of all temperate countries, they have stout tapering rootstocks, alternate leaves, and greenish flowers without petals arranged in whorled clusters. The leathery red or brown fruits are three-sided. Some of the species are notorious pests of agriculture; others, owing to their acidity, are esteemed as

salads and potherbs, especially the smaller species known as sorrels.

**Dock.** Artificial construction enclosing, or partly enclosing, a calm water area in which ships can lie afloat against quays for the purpose of loading or discharging goods or passengers.

Where the rise and fall of the tide is small, as in the Mediterranean, or moderate, as at Southampton, the docks may be open to the tide. In such docks the water depth at the lowest state of the tide must be more than the draught of the largest vessels that use them. Sometimes a tidal basin of this kind is provided between a tidal sea or river and a closed dock.

Where the tidal range is considerable, docks are generally separated from tidal waters by an entrance provided with one pair of gates or by a lock. By this means the water level in the dock can be maintained near high tide level. The effect is that ships can be accommodated in closed docks of much less overall depth than would

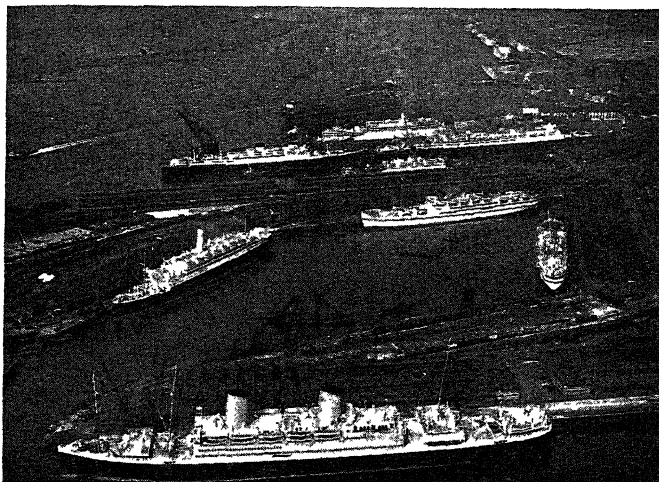
be needed in open or tidal docks in the same locality, so lessening the cost of construction. A further benefit is that the ship is kept at a nearly constant level relative to the quay, which facilitates loading and discharging.

Where only one pair of gates is provided, these are opened only for two or three hours about high tide, to avoid reducing the depth of water in the dock to too low a level.

If ships are to enter or leave the dock at any state of the tide, a lock (*q.v.*) with two pairs of gates, and of a sufficient size to accommodate the largest vessel using the dock, must be provided to raise or lower vessels between dock water level and tidal water level. A few docks are impounded or kept at a water level higher than high tide level, by pumping water from the sea or river into the dock.

The sides of the dock may consist of concrete or masonry walls with vertical faces to the water, against which ships can berth. Another type of quay is a thin wall of steel or concrete sheet piles driven into the dock bottom and anchored back at the top by tie rods. The wall supports the ground behind in the same way as a masonry wall. Alternatively the quays may be of open construction carried on cylinders or piles and made of timber, steel, or reinforced concrete. Other types of berthage are provided for specific purposes.

Entrance gates, like lock gates, were formerly made of wood, but current types are hollow boxes of steel plates with internal steel framing. Internal subdivisions are provided, with arrangements for water ballasting so that the gates when in use are only slightly too heavy to float. They can thus be opened and closed with little effort compared with the older solid gates which had to be supported by rollers running on the floor. Each leaf of a pair of gates is larger than half the width of the entrance, so that when closed the leaves meet at



**Dock.** Air view of Southampton Docks, showing several great liners at their berths. This is an example of the open dock system

an obtuse angle pointed towards the dock. The vertical meeting faces are of timber, generally greenheart, as are the heel posts at the pivot edge of each gate, and the clapping sill along the lower edge. When closed, the timber clapping sill of each gate bears against the vertical face of a granite sill formed in the bottom of the entrance.

The construction of the gates, sill, and walls is such that the difference in water level between the dock and the outside water forces all the meeting faces tightly together and so keeps them watertight. In some gates sluices are

provided in the gate structure for passing water out of the dock to reduce its level when required; but a newer practice is to pass the water through sluice controlled culverts in the dock walls.

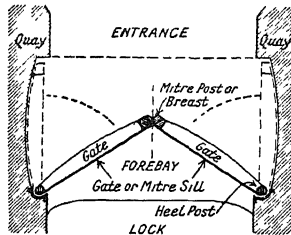
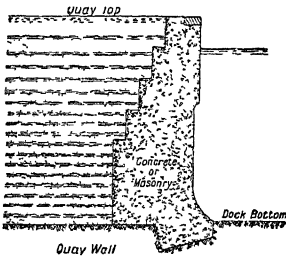
The older types of gates are opened and closed by chains hauled by winches, manually or mechanically operated. Newer types are generally operated by hydraulic rams, though electric gate machines also exist. When open the gates fit into recesses in the entrance walls so as to leave unobstructed the full width between the walls.

Alternative methods of closing dock entrances are rolling or sliding



**Dock.** Part of London's great enclosed dock system, which is situated on both sides of the Thames. In the centre are seen the West India docks, in the Isle of Dogs

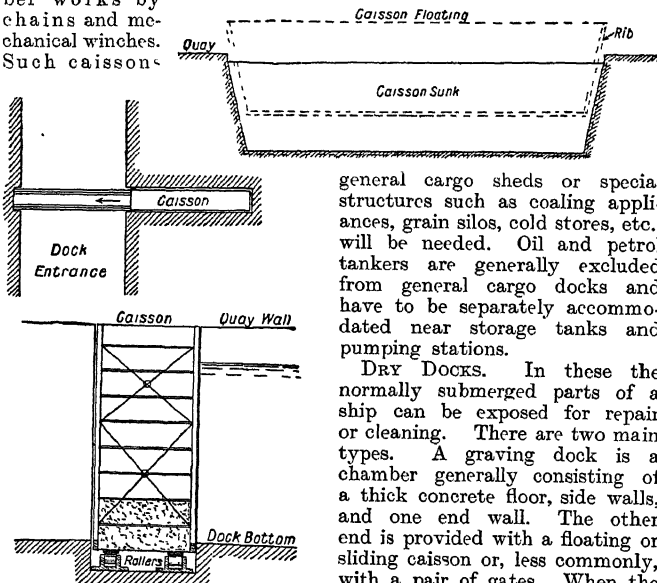




Dock. Left, sectional diagram of quay wall. Right, plan of dock gates; when open, they fit into recesses in the quay walls

caissons which may be likened to sliding doors. When open they rest in chambers built into the walls; when closed they bear against meeting faces prepared in the walls and floor of the entrance. Haulage in and out of the chamber works by chains and mechanical winches. Such caisson-

For efficient operation, docks must be provided with roads and railways along the quays, cranes of types suitable for handling cargo, capstans and bollards for manoeuvring and mooring ships. According to the trade dealt with,



Dock. Rolling caisson for dock entrance, in plan (above) and in section (below). Top right, floating caisson in section

have the advantage over gates of providing support for a straight roadway of useful width across the entrance, but, slower to operate, are less suitable for busy entrances.

Another closing device is the floating caisson, but this is very slow in operation and its use is limited to the entrances to dry docks. It is a steel vessel of adjustable draught so shaped that it can be sunk to fit into grooves made in the walls and bottom of the entrance, or floated to clear the grooves and be towed away. Watertightness is provided by timbers on the caisson bearing on prepared masonry faces.

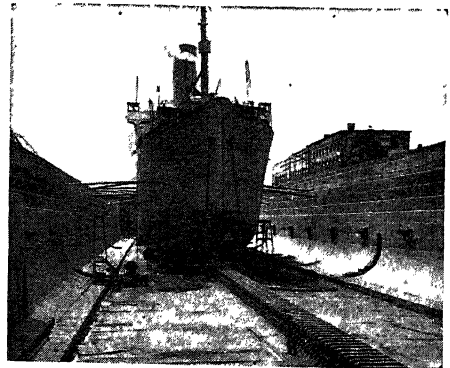
general cargo sheds or special structures such as coaling appliances, grain silos, cold stores, etc., will be needed. Oil and petrol tankers are generally excluded from general cargo docks and have to be separately accommodated near storage tanks and pumping stations.

**Dry Docks.** In these the normally submerged parts of a ship can be exposed for repair or cleaning. There are two main types. A graving dock is a chamber generally consisting of a thick concrete floor, side walls, and one end wall. The other end is provided with a floating or sliding caisson or, less commonly, with a pair of gates. When the entrance is open the dock is full of water, permitting a ship to be floated in. The entrance is then closed and the dock emptied by pumping. Where the graving dock is entered from tidal water, it may be partly emptied by the fall of the tide. As the water level falls the vessel settles on to previously arranged keel blocks and bilge blocks and may be supported by struts between the sides of the dock and the sides of the vessel. When the vessel is ready to leave the dock, water is

readmitted, the entrance opened, and the vessel floated out. Graving docks are generally operated as part of a ship-repairing organization and are provided with large cranes for lifting heavy parts.

A floating dock is itself a vessel designed to lift a ship until it is completely out of the water. The floating dock consists of a floor and two side walls, all constructed as hollow steel boxes subdivided into chambers which can be flooded or emptied to vary the depth of flotation of the dock. Pumping machinery and compressed air plant are installed in the walls for this purpose. To dock a vessel, the floating dock is submerged sufficiently for the vessel to be floated in over the dock floor. The dock is then raised, by pumping out water, until the vessel rests on the prepared keel and bilge blocks on the floor of the dock. Pumping continues until the ship and the dock floor are raised clear of the water. Struts may also be used to support the sides of the vessel. The vessel is refloated by refilling the dock with water. An interesting feature in most floating docks is the "self-docking" principle, by which the dock is divisible into sections each of which can itself be raised out of the water for inspection and repair. Most floating docks are of steel, but they have also been built of timber and reinforced concrete.

Floating docks can be towed from place to place and are therefore of great value for naval purposes. They have a shorter life than graving docks and are more costly to maintain. It is also essential that they should have both deep water and secure anchorage. They are normally provided with cranes running on the walls, and are frequently



Dock. Graving dock at Southampton, with a vessel on keel blocks ready for repair



connected to land by fixed structures, but ship repairing operations are naturally more difficult than in graving docks surrounded by solid land.

A variant of the floating dock is the depositing dock, consisting of one wall and a floor of separate pontoons upon which the vessel is lifted. The dock is then moved so that its pontoons alternate with sections of a fixed staging upon which the vessel is deposited by submerging the dock, which can then be removed for use with another staging. This system is suitable for small vessels only and is not greatly used.

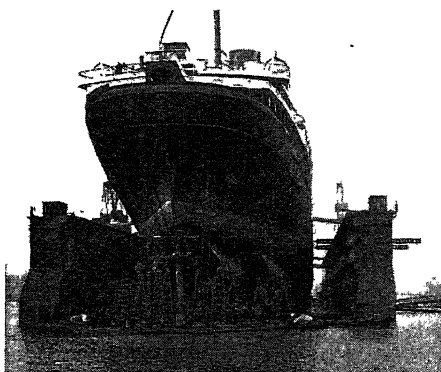
Small vessels are generally repaired on slipways. These are inclined railways on which wheeled cradles can be run down below water and under the vessel, which is then hauled up to the above-water portion of the slipway. Consult Dock Engineering, B. Cunningham, 1922; Docks, Wharves, and Piers, F. M. G. Du Plat-Taylor, 1928.

M. Nachsen, M Inst.C.E.,  
M.I Struct.E.

**Dock.** Place in a court of law in which prisoners stand during trial. It is usually an enclosure surrounded with rails, and facing the judge. The word appears to be derived from the room in the Old Bailey which, it is said, was called bail-dock by the criminals. See Court; Criminology.

**Dock Brief.** A prisoner on trial at assizes or quarter sessions for an indictable offence or appealing to the court of criminal appeal is entitled to instruct any barrister in court to appear for him for a fee of 23s. 6d., or in some courts a guinea.

**Docker.** Workman employed in handling cargoes in ships and warehouses or on quays. Dock labourers in the U.K. are officially styled port transport workers and numbered about 110,000 in 1946. For long this type of labour was poorly paid, the working hours being irregular and uncertain; and many unnecessary hardships were inflicted on the workers, a state of affairs first brought to public attention in 1889 when, under the leadership of Ben Tillett, Tom Mann, and John Burns, the London dockers went on strike for a wage of sixpence an hour ("the docker's tanner") and a minimum engage-



Dock. Floating dock at Southampton, with the liner Majestic undergoing an overhaul

ment of four hours. The public subscribed £48,736 to a strike pay fund, towards which also over £30,000 was remitted by telegraph from Australia. Thanks to this practical sympathy, the dockers won their demands. But conditions remained bad, owing to the casual nature of the work. In 1920 a committee inquired exhaustively into wages, hours, etc., and recommended a substantial advance of wages, together with a system of registration and maintenance grants to counteract the evils of casual labour; but little came of these proposals.

In 1940 the British government made registration schemes at the ports compulsory; the following year the ministry of War Transport became responsible for the employment of dock labour in the ports of the Mersey and Clyde, workers receiving for the first time a guaranteed weekly payment of £4 2s. 6d. In June, 1941, the National Dock Labour Corporation Ltd. was established to operate the Dock Labour Essential Work Order at all principal ports, except those of the Mersey and Clyde. It accepted responsibility for payment of a guaranteed sum of 6s. for each half-day on which a man was unemployed. In 1946 the Dock Workers (Regulation of Employment) Act did away with casual employment in the docks. See Casual Labour.

**Dockers' Battalion.** British corps raised by Lord Derby in 1915 for unloading military supplies at Liverpool. Men ineligible for combat duties on account of age or physical disability were enlisted into the army, provided with uniform, and were subject to military discipline. The Liverpool battalion was attached to the King's Liverpool Regiment, and Lord Derby, with temporary rank

of colonel, was appointed O.C. A similar organization, the Transport Workers' Battalion, was soon raised for duty at the London docks and attached to the York and Lancashire Regiment. These battalions were distinct from the Labour Corps (*q.v.*), which also supplied companies of dock labourers.

During the Second Great War, loading and unloading of ships at military ports and bases were carried out by dockers' companies of the Royal Engineers and Pioneer Corps (*q.v.*). Units of these two corps served in all theatres of operations, earning distinction in N. Africa and Italy, where they frequently worked under shell fire and aerial bombardment. Unlike the military dockers of the First Great War, they were trained and equipped to take their place as combat troops if necessary.

**Dock Warrant.** Document given to the owner of goods lying warehoused in a dock, stating to whom they belong. If the goods change hands the document should be endorsed and given to the new owner. These warrants can usually be placed as security with bankers and must bear a stamp.

**Dockyard.** Government naval establishment comprising engineering works, slipways, stores, etc., where ships of war are constructed or repaired, supplied with material and personnel, and made ready for sea. Normally, however, dockyards are mainly used for overhauling and refitting, the bulk of new construction being given to private shipbuilders on the Clyde, Tyne, or elsewhere. They are administered by a director of dockyards, assisted by the director of stores and director of naval construction, and a special department at the Admiralty; but the additional civil lord, who is controller of the navy, is charged with their general management, and all business matters relating to them.

The first dockyard in British naval history was built at Woolwich (*q.v.*) in the reign of Henry VIII. Others were then built at Portsmouth, Deptford, Chatham, and Sheerness, and under William III, at Plymouth. In 1814 a yard was built at Pembroke to replace one at Milford Haven. The chief dockyards of the British Empire are at Chatham, Devonport and Keyham, Harwich, Haulbowline, Invergordon, Pembroke, Portsmouth, Rosyth, Sheerness, Gibraltar, Malta, Ascension, Bermuda, Simonstown, Sydney.

During the Second Great War the royal dockyards at home and

overseas had to maintain a world-wide docking and repair organization for all the requirements of British and Allied naval vessels. Work had to be done with the greatest expedition, particularly on destroyers and escort vessels engaged in the battle of the Atlantic, generally in complete secrecy and frequently in the face of intense air raids. Some 97,000 refits were completed in the royal dockyards between 1939 and 1945. Amongst the new warships built were one aircraft carrier, four cruisers, four sloops, and 22 submarines. Six floating docks and a large proportion of the landing craft used for combined army and naval amphibious operations were built. The dockyards further performed innumerable tasks in the operation and maintenance of naval air stations, training establishments, barracks, and fleet bases.

Leading dockyards of other countries include: Boston, Brooklyn, Key West, Norfolk, Va., Portsmouth, N.H., and Pensacola in U.S.A.; Brest, Cherbourg, Lorient, Rochefort, and Toulon in France; Naples, Spezia, and Venice in Italy; Kronstadt, Sevastopol, and Leningrad in Russia. At the end of the Second Great War, the Kiel and Wilhelmshaven dockyards in Germany and those at Kure and Nagasaki in Japan were destroyed.

**Doctor** (Lat., teacher). Name applied in the Middle Ages to a teacher of logic and theology, but now generally denoting a medical practitioner. For specially eminent teachers the word was coupled with a descriptive adjective, and used as a title, e.g. William of Occam was the invincible doctor, Bonaventura the seraphic doctor. The title Doctors of the Church was given to certain early fathers distinguished by their authoritative teaching and sanctity. The university degree of doctor was first conferred, in law or divinity, at Bologna about 1130, in Paris towards the end of the 12th century, and in England in the 13th century, and that in medicine in the 14th century. Doctors' degrees in music, philosophy, science, literature, and other faculties followed. Honorary doctors' degrees are conferred, those granted by the archbishop of Canterbury being known as Lambeth degrees. (See Degree.)

The name doctor is also applied to various mechanical appliances, especially contrivances for remedying defects, e.g. in textile printing and paper-making the "doctors"

are metal blades which remove colour, threads, and other superfluous matter from the rollers. The name is also given to the lancet-fish (*Acanthurus*), and to an artificial fly used by anglers. From the practice of doctoring or darkening light-coloured wines, brown sherry is sometimes called "doctor."

**Doctors' Commons**, or "The College of doctors of law exercent in the ecclesiastical and admiralty courts." Society or college of English lawyers of considerable antiquity. It obtained a charter in 1768 and had its headquarters near S. Paul's cathedral, London. Its members, who were called fellows, had the sole right of appearing in ecclesiastical (including divorce), probate, and admiralty courts, while proctors, who did the work of solicitors, were attached to it. The members had to be doctors of law of either Oxford or Cambridge, and from them the judges of the archbishops' courts were always chosen. Under the Probate Act of 1857 this college was dissolved.

**Doctrinaire** (late Lat. *doctrinarius*). A term commonly applied to the politician, economist, scientist, or artist who maintains that a definite end can be attained only by following certain principles, and thereby makes the means of greater importance than the end. The word, used in France after the restoration of the Bourbons in 1815, as a journalistic nickname for the philosophic statesman Royer-Collard, came to be applied to the political group of constitutional royalists led by him and supported by Guizot, Camille Jordan, and others. In 1830 the Doctrinaires were merged in the Orleanist party.

**Doctrine** (Lat. *doctrina*, instruction). Word used generally for the instructions given or principles taught by a particular person to his followers, and for the declared tenets of a society of persons. Thus Christian doctrine is both the teaching of Christ set out in the N.T. and the body of belief contained in the catechisms and other official documents of the Christian churches. Every sect of Christians has also its particular and distinctive doctrine expressed in its own formularies. Philosophy, politics, economics, science, and art all have their doctrines, i.e. precepts expounded by certain persons and schools of thought.

**Document** (Lat. *docere*, to teach). Term used for printed or written matter of an important kind. In law it means anything

that can be used in evidence, and in the plural is frequent in the vocabulary of lawyers. It is also used for papers of interest and value to the historian. See Evidence; Film; Manuscripts.

**Dodabetta**. Mt. of Madras, India, in the Ootacamund subdivision of the Nilgiri district. It is 8,760 ft. above sea level, the highest point in the Nilgiri Mts., and is the second highest point S. of the Himalayas. Cinchona and ipecacuanha are cultivated on the slopes. Ootacamund, the hot weather seat of the Madras gov. lies N.

**Dodd, FRANCIS** (1874-1949). British artist. Born at Holyhead, Nov. 29, 1874, he studied at the Glasgow art school and in France and Italy. Elected a member of the New English art club in 1904, he was one of the official war artists during the First Great War, and executed a valuable series of portraits of British admirals and generals on active service, published in 1917, and other works, remarkable for detail. Trustee of the Tate Gallery, 1929-35, A.R.A., 1927, and R.A., 1935, he took his own life, March 7, 1949.



Francis Dodd,  
British artist

**Dodd, WILLIAM** (1729-77). An English preacher, forger, and man of letters. Son of the vicar of



William Dodd,  
English preacher  
From an engraving

Bourne, Lincs, he was born May 29, 1729, and educated at Clare College, Cambridge. He was ordained in 1751, and became a curate at West Ham. Popular as a preacher at the Magdalen Institution, in 1763 he was made chaplain to the king. Falling into debt, he forged Lord Chesterfield's name to a bond for £4,200. Arrested, he returned £3,000, promised £500 more, and offered security for the remainder. He was, however, at the instance of the lord mayor, committed for trial, sentenced May 26, and, despite the efforts of Dr. Johnson and others on his behalf, hanged on June 27, 1777. His works include *Beauties of Shakespeare*, 1752; *Commentary on the Bible*, 1765-70; and *Thoughts in Prison*, 1777. Consult *A Famous Forgery*, P. Fitzgerald, 1865.

**Dodd, William Edward** (1869-1940). American historian and diplomat. Educated at Virginia polytechnic institute, he was professor of history at Randolph-Macon College, 1900-08, and later at Chicago university. U.S. ambassador to Germany from 1933, he resigned in 1937 on account of his strong democratic principles and dislike of Nazism. Editor of *The Riverside History of the U.S.A.*, 1915, his publications included *Woodrow Wilson and his Work*, 1920; *Ambassador Dodd's Diary*, 1941. Dodd died Feb. 9, 1940.

**Dodder** (*Cuscuta*). Genus of annual, herbaceous, leafless parasites of the family Convolvulaceae. They are natives of temperate and tropical countries. The seeds germinate in the ground, but the seedlings attach themselves by suckers to young plants such as clover, vetch, thyme, furze, or flax. The growth of the host plant lifts the dodder from the ground, its roots perish, and it becomes entirely parasitical. Its red, yellow, or white thread-like stem twines in a tangle round its



Dodder. The herbaceous parasite on the smaller furze

host, and at intervals gives off clusters or spikes of minute, pitcher-shaped flowers.

**Doddridge, Philip** (1702-51). English divine. Born in London, June 26, 1702, he was educated at

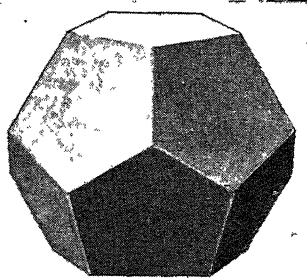


*From an engraving*

where he was minister in 1722. Seven years later he was pastor at Northampton, where he founded a seminary for training Nonconformist ministers. He was a keen advocate of the use of shorthand. He did much to promote foreign missions and the

education of the poor, and was the author of some famous hymns (collected after his death), and of the popular *Rise and Progress of Religion in the Soul*, 1745. He died at Lisbon, Oct. 26, 1751.

**Dodecahedron** (Gr. *dōdeka*, twelve; *hedra*, seat, surface). Twelve-faced solid, each of the



Dodecahedron, a twelve-faced solid

faces of which is a regular pentagon or five-sided figure. When all the thirty edges are the same length the solid is regular.

**Dodecanese** (mod. Gr. *dōdeka*, twelve; *nēsia*, islands). Name given to twelve islands of the Aegean: Nisyros, Cos, Casos, Patmos, Charki, Leros, Tilos, Symi, Astropalia, Lipso, Carpathos, and Kalimno. They lie S. of the islands of Nikaria and Samos, and N. of the E. extremity of Crete, in the Aegean, off the S.W. coast of Asia Minor. Pop. 58,962, nearly all Greeks of pure Ionic stock. The islands were occupied by Italy in April, 1912, in the course of her war with Turkey over Tripoli, and retained by her in spite of the protests of the inhabitants. In 1920 Italy transferred the islands to Greece, but in 1922 repudiated the cession.

Apart from their wealth in fruit and domestic animals, Rhodes and the Dodecanese islands are of great strategic value for any military operations in S.E. Europe. After the entry of Italy into the Second Great War in June, 1940, her bases and aerodromes on the islands were frequently bombed by Allied aircraft, while British warships carried out periodic bombardments.

After the surrender of Italy in Sept., 1943, small Allied forces were landed on Cos, Leros, and Samos. Cos (*q.v.*) was finally taken by the Germans on Oct. 11; Leros was heavily raided at the end of the month. German troops landed from the sea on that island on Nov. 12, and by parachute in the central section. Lack of reinforcements and air protection led to the

overwhelming of the garrison on Nov. 16. The British troops on Samos were reinforced by Greek soldiers of the Sacred Brigade, dropped by parachute. The island was occupied by the Germans on Nov. 21 after all British and Greeks, some Italian troops, and the majority of the inhabitants, had been evacuated in ships of the Royal Navy.

On May 9, 1945, Allied troops landed on the occupied islands to receive the surrender of the German garrisons. Under the peace treaty between the Allies and Italy signed in Paris, Feb. 10, 1947, Italy again ceded the islands to Greece, who took over their administration on March 31.

**Döderlein, Ludwig** (1791-1863). German classical scholar. Born at Jena, he became professor of philology at Erlangen in 1819, which post he held till his death. He was the author of a valuable work on Latin Synonyms and Etymologies, of a handbook on Synonyms (Eng. trans.), and of a Homeric Glossary.

**Dodge, Henry Percival** (1870-1936). American diplomat. He was born at Boston, Jan. 18, 1870, and educated at Harvard. Admitted to the bar in 1895, he was attached to the U.S. embassy in Berlin, 1899-1906, and transferred to Tokyo, 1906-07. Later he was successively American minister to Honduras, Salvador, Morocco, and Panama. In 1914, on the outbreak of the First Great War, he was appointed special agent for the repatriation of Americans in Europe. He died Oct. 16, 1936.

**Dodge, Mary Mapes** (1838-1905). American author. She was born in New York, a daughter of

a professor of chemistry, and married at an early age William Dodge, a lawyer. On her husband's death she was left with two young sons



Mary Mapes Dodge, American author

to support, and turned to writing stories and verses for youthful readers. On the starting of St. Nicholas, 1873, she was appointed editor, and for many years maintained it in the front rank of magazines for the young. Her many volumes of fiction included *Irvington Stories*, 1864; *Hans Brinker*, or the *Silver Skates*, 1865, her most popular tale, which was awarded a prize by the French

Academy; Donald and Dorothy, 1883; and The Land of Pluck, 1894; while among her verses were Rhymes and Jingles, 1874; Along the Way, 1879; and Poems and Verses, 1904.

**Dodgson, CHARLES LUTWIDGE.** English writer and mathematician, better known as Lewis Carroll (*q.v.*), the pseudonym under which he wrote Alice's Adventures in Wonderland, etc.

**Dodman, THE.** Headland of Cornwall, England. It is on the S. coast at the E. end of Veyan Bay, 8 m. S. of St. Austell. It stands about 400 ft. high, and affords magnificent views. In 1918 it passed from the earl of Mount Edgcumbe to the National Trust. The Dodman is Dead Man's Rock of Quiller-Couch's novel.

**Dodo** (Port. *doudo*, stupid). A large extinct bird (*Didus ineptus*), formerly inhabiting Mauritius. It was related to the pigeons, and was rather larger than a swan. The plumage was grey, the tail feathers short and curly. The head bore a massive beak, the legs were exceptionally stout, and the wings rudimentary. It became extinct towards the close of the 17th century.

**Dodona.** Oracle of Zeus near Mt. Tomoros or Tmaros in Epirus, ancient Greece. The responses of the god were supposed to be declared

by the rustling of the wind in the oak or beech trees. According to one story, a black pigeon from Egyptian Thebes is said to have perched on an oak at Dodona and commanded an oracle to be founded there. The responses were originally interpreted by priests called Selli, afterwards by old women called Peleïades (pigeons). The oracle of Dodona was often consulted in preference to the more famous oracle at Delphi, which was supposed to favour the Dorians.

**Dods, MARCUS** (1834-1909). A British theologian. The son of a Presbyterian minister, he was born at Belford, Northumberland. Educated at Edinburgh academy and university, he became a minister, and from 1864 to 1889 was minister of Renfield Free Church, Glasgow. In 1878 he was charged with holding unorthodox views, the matter coming before the general assembly. However, theology became more liberal, and in 1889 Dods was made professor at New College, Edinburgh. In 1907 he was

chosen principal of the college. He died April 26, 1909. He wrote The Bible: its Origin and Nature, 1905, and other works giving the results of the higher criticism.

**Dods, MEG.** In Scott's novel, St. Ronan's Well, hostess of the Cleikum or Mowbray Arms Inn, in the Old Town of St. Ronan's. For favoured visitors she could make her inn "the neatest and most comfortable old-fashioned house in Scotland"; but usually she "ruled with a high hand, not only her men-servants, but over the stranger within her gates." Her pet phrase was "What for no?" She described her bark as worse than her bite, but her tongue, "when in full career, is vouched to have been heard from the kirk to the Castle of St. Ronan's." Her ire was specially directed against a rival and "fashionable" establishment, the Fox Hotel.

**Dodsley, ROBERT** (1703-64). English publisher. Born at Mansfield, Notts, Feb. 13, 1703, son of a schoolmaster, he was first a stocking weaver, then a footman. With the profits of A Muse in Livery (1732), and a dramatic satire, The Toy-Shop (1735), written while still a footman, and with the help of Pope and others, he opened a bookshop, The Tully's Head, Pall Mall. He issued A Select Collection of Old Plays, 12 vols., 1744; with Burke founded The Annual Register, 1758; and published for Pope, Gray, Goldsmith, Sterne, Young, Akenside, and Johnson, to whom he suggested a plan for an English dictionary. He died at Durham, Sept. 23, 1764.

**Doe, JOHN, AND ROE, RICHARD.** Imaginary names used in English legal procedure for purpose of convenience. For instance, if Thomas Jones wished to claim freehold land in the possession of John Smith, he could best do it in an action of ejectment. But an action of ejectment could be brought only by a leaseholder, and not a freeholder. So Jones created a fictitious lease to John Doe, and then brought an action, "John Doe on the demise of Thomas Jones v. John Smith." John Doe by his claim then said that he was a tenant of Jones, and Smith had ejected him "with force and arms, battle-axes, spears, bows," and other weapons. Richard Roe was a similar creation. At one time he was made defen-

dant. He was supposed to be the real defendant's (Smith's) tenant; and Smith used to come in and vouch for him. This legal fiction was abolished by the Common Law Procedure Act of 1852.

**Doenitz, KARL** (b. 1891). German sailor. Born at Grünau, near Berlin, he joined the German imperial navy in 1910 and, on the outbreak of the First Great War, was transferred to the naval air arm. A U-boat commander, 1916-18, he was captured by the British and interned in Great Britain, but later released as the result of feigning madness. In 1929 he became commander of the cruiser Emden. He studied U-boat warfare in all its aspects, joined the Nazi party, and organized the secret construction of U-boats. On the outbreak of the Second Great War he was in command of a U-boat flotilla. Promoted admiral in 1942, he became grand admiral and c.-in-c. of the German navy the following year, and was responsible for the U-boats' "pack" method of attack. During the final German breakdown in May, 1945, announcing his appointment as Hitler's successor, Doenitz negotiated the surrender of the German armed forces. He was arrested at Flensburg on May 23. He was named among the major war criminals, appeared before the international tribunal at Nuremberg, was found guilty of crimes against peace and of crimes committed in warfare, and was sentenced to 10 years' imprisonment on Oct. 1, 1946.

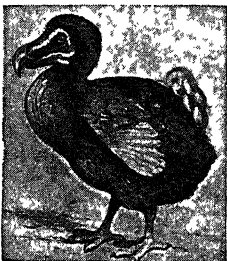
**Doesburg.** Town of Holland, in the prov. of Gelderland. It stands at the junction of Old and New Yssel, 6 m. S.E. of Dieren. It has a 15th cent. church.

**Dog.** In zoology, name applied to a family (*Canidae*) of flesh-eating mammals. They are placed between cats and hyaenas on the one hand, and weasels and bears on the other. This family includes all wild and domesticated dogs, as well as the wolf, fox, and jackal.

Dogs are digitigrade, *i.e.* they walk on their toes, and have blunt claws that cannot be retracted like those of the cats. They have four toes on the hind feet, and, except the Cape hunting dog, five on the fore feet. All have long muzzles and a large number of teeth, usually 42. Although a fox and a bulldog, or a



Karl Doenitz, German sailor



Dodo. Reconstruction of the extinct *Didus ineptus*



1 Field spaniel 2 Skye terrier 3 Brussels griffon 4 Cocker spaniel 5 Bull terrier 6 Alaskan Eskimo dog 7 Pug 8 Smooth fox terrier 9 Great Dane 10 Black retriever 11 Beagle hound 12 Basset hound 13 Collie 14 Otter hound 15 Mastiff 16 Bulldog 17 King Charles spaniel 18 Scotch terrier 19 Whippet 20 Newfoundland 21 Scotch deerhound 22 Saint Bernard

**DOG: CHARACTERISTICS AND COLOURING OF VARIOUS BREEDS**



1 Irish terrier. 2 French bulldog 3 Wire haired fox terrier 4 Dachshund 5 Chow 6 Pekinese. 7 Yorkshire terrier. 8 Clumber spaniel 9. Dalmatian 10 Pointer 11 Foxhound 12 Setter 13. Greyhound 14. Blood hound 15 Baston terrier 16 Pomeranian 17. Schipperke 18. English sheep dog 19. Airedale terrier 20 Russian Borzoi 21 French corded poodle

DOG: TYPES FAMILIAR IN FARM FIELD. AND HOME



wolf and a Maltese terrier, differ greatly in appearance, in all important anatomical features they are so nearly identical as to justify their inclusion in the same family.

All dogs in the wild state are of dull and inconspicuous coloration, except the Cape hunting dog, which is black and yellow, and in general appearance resembles a hyaena. Most of them assemble in packs for hunting, which they do mainly by scent, and the common cry of all is a howl rather than a bark. They live in burrows, caves and clefts in rocks, and most of them are nocturnal in their habits. They are found in nearly all parts of the world, Madagascar and Ceylon being the only notable exceptions. Of the various wild species, the dingo of Australia, probably introduced by man at a remote epoch, is the best known. It works havoc among the flocks, and is one of the greatest pests of the country. The Asiatic wild dogs are represented by the pariah dogs of India and the dholes, which are somewhat like jackals in appearance. Both the African wild dogs, the Cape hunting dog and the long-eared Cape dog, present so many features of difference from the true dogs that they have been formed into separate genera. While the former resembles a hyaena, the latter is strikingly like a fox. In S. America there are the crab-eating dog and the bushdog.

#### Dogs and Wolves

Of the numerous breeds of domestic dog the Kennel Club recognizes only 82, but naturalists have distinguished as many as 185 varieties. There is little doubt that the domestic dog has descended from the wolf, with a possible admixture of the jackal. Dogs interbreed freely with wolves and their offspring is fertile, which is not usually the case with hybrids between different species. The less specialised breeds closely resemble the wolves of their native lands. The dogs of the Eskimos and the N. American Indians are nothing more than domesticated wolves, and it is the common practice to tie up the females in the forests that they may be served by the wild wolves, with a view to maintaining the stamina and hardness of the breed. The domestication of the wolf is by no means so difficult as is usually supposed, especially in the case of the American species. There is, however, one striking difference between the modern dog and his wild cousins. The pupil of the dog's eye is round, while that of the fox and jackal is vertical; and in the wolf it is placed obliquely.

The domesticated dog was known in the earliest historical times. In prehistoric days neolithic man appears to have had two species of dog associated with him, for their remains have been found in the Danish kitchen middens, the Swiss lake villages, and other centres of habitation. Whether these dogs ever roamed Europe in a wild state or were only domesticated wolves is a moot point. Within the historic period we find the dog venerated by the ancient Egyptians, which is possibly the reason why it was held in such abhorrence by the Hebrews as an unclean animal. The Assyrians and Babylonians used the dog in hunting, and it is remarkable that both Assyrian and Egyptian sculptures show several types of dog that can be recognized to-day. Strabo states that in early Britain bloodhounds were used in war, and in the Norman period we find mention of hunting dogs. More than a dozen breeds were maintained in the 15th century.

#### Classification of Dogs

Of all animals the dog is the most suitable and useful as a companion for man. It has been maintained that the dog is the most intelligent animal next to man, and although this is open to doubt, there is no question that its intelligence is of a very high order. The value of this is greatly augmented by the fidelity of the dog, which has often been known to sacrifice its life in defence of its master. The Romans classified dogs as hunting dogs, sheep dogs, and watch dogs, and the division still holds good. But it is more usual now to classify them as hounds, sheep dogs, terriers, spaniels, mastiffs, and lap dogs. They range in size from the Tibetan dog and the Great Dane down to the tiny Japanese lap dog, which is often valued at its weight in gold.

Dog breeding is now an important industry. Unfortunately, the tendency has too often been to breed for the purpose of intensifying eccentricities, as in the case of the modern bulldog, rather than to develop qualities of practical utility. Still, much has been done by careful selection to improve the hunting varieties, and by skilful crossing some useful new breeds have been evolved. An example of this is seen in the whippet, which is a cross between the English greyhound, the Italian greyhound, and a terrier. A remarkable example of what can be accomplished by scientific breeding is seen in the reappearance of the extinct Irish wolfhound. In the 'sixties, Captain Graham of Dursley, in Gloucestershire, by skilful

and repeated crossing of dogs known to be descended from the original breed, ultimately succeeded in reproducing all the points of the genuine wolfhound.

#### Dog Shows and Breeding

In 1776 the first dog club was founded by Lord Orford, but it was not until 1859 that the first dog show was held at Newcastle-on-Tyne. Since that date shows have become so popular that about 500 are held locally in Great Britain every year, and the number of dogs exhibited has grown from 60 to many thousands. The growth of the fancy has resulted in making dog breeding a lucrative business. The sum of £1,000 has been paid on several occasions for champion bulldogs and St. Bernards, while a fox-terrier has been known to change hands for £500. A collie has fetched £1,500. Mrs. J. B. Walz in South America refused £3,000 for a bulldog. The Kennel Club was founded in 1873 by S. E. Shirley, and now virtually controls the dog fancy of the world. All the recognized shows are held under its rules, and it has exercised great and beneficial influence in controlling the vagaries of breeders, and in suppressing many cruel and objectionable practices. There are also clubs in connexion with all the leading breeds, both in the United Kingdom and abroad. Sectional shows are regularly held, stud books are carefully kept, and the fancy, as it is called, is thoroughly organized.

**DOGS AND THE LAW.** The owner of a dog that bites anyone may be liable in damages if he knew the dog was liable to attack human beings. The owner is also liable for all injury done by a dog to horses, mules, sheep, goats, pigs, or poultry, even though he did not know the dog to have a propensity for such acts.

Among works of reference on dogs may be mentioned *The Dog Owner's Manual* J. Z. Zine, 1937; *The Kennel Encyclopedia*, ed. F. T. Barton, 1946.

**Dog.** In mechanics, a catch of various kinds. A dog-shore is a prop of timber used to support a vessel until the moment of launching, which is accomplished by knocking the dog-shores away. A timber-dog is a bar of metal with ends turned at right angles to the middle part and sharpened to hold large balks together. A dog-clutch is a sliding clutch with jaws which interlock when one part is moved endways. Dog-spikes with flattened heads are used to secure flat-bottomed rails to their sleepers.

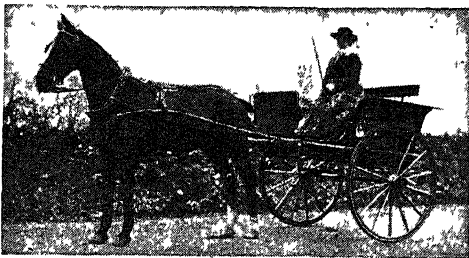


**Dogberry.** Chief comic character in Shakespeare's *Much Ado About Nothing*. A city constable, his self-satisfaction and abuse of language and logic provide relief to the serious interest of the play.

**Dogcart.** High two-wheeled open, one-horsed vehicle with two transverse seats placed back-to-back, for four passengers. The rear seat folds up, and the back foot board can be fixed up to enclose the body of the cart. Dogcarts are sometimes used when driving tandem. See Coach.

**Dog Cockle.** In conchology, the popular name of a bivalve found round the British coast. It is the *Pectunculus glycymeris* of the family Arcadae, and has almost circular shells, yellowish-white in colour with irregular dark-red markings. Large specimens measure as much as 2½ ins. across. It is sometimes known as the combshell, from the many teeth on the inner edge of the shell. See Bivalves illus.

**Dog Days.** Period about the time of the heliacal rising of the Dog Star, i.e. the time when it first emerges from the sun's rays and becomes visible before sunrise. The ancients attributed the heat and unhealthiness of the season and the highest rising of the Nile in Egypt to the influence of the Dog Star. The time of heliacal rising of the Dog Star depends on latitude, and occurs later each year owing to the precession of the equinoxes. The date of the first dog day ranges from July 3 to Aug. 15, and the duration of the period from 30 to 54 days. Now, the dog days are July 3-Aug. 11.



Dogcart. Single-horse dogcart with rubber-tired wheels  
W. A. Roush

**Doge** (Lat. *dux*, a leader). Title of the heads of the republics of Venice and Genoa. Soon after 700 a doge appears in the history of Venice, which, with the adjacent cities, had hitherto been ruled by tribunes. The first doge was Paolo Lucio Anafesto. Soon the republic came into being as an independent state, and its ruler, the doge, enjoyed great power and prestige. There were attempts, especially in the 10th century, to make the office



Doge. Fishermen presenting the ring of S. Mark to the Dogs of Venice, as depicted in Bordone's masterpiece  
Accademia, Venice

hereditary in certain powerful families, e.g. the Orseolo, but they were defeated, and at various times the laws governing the election were altered.

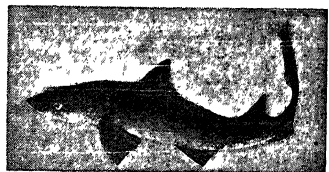
At one time the doge was chosen by a body of eleven persons nominated by the great council of 480; later, the electors numbered 40, and then, to avoid the possibility of a tie, one more was added.

They were chosen by four persons nominated by the great council.

After 1268 there was a more elaborate system of choosing the 41 electors, the object still being to check the power of certain families. Lots were cast several times until eventually 41 persons were selected who were the actual electors. Gradually the powers of the doge were definitely limited, but he remained a splendid figure ceremonially, having in Europe the

rank of a sovereign prince, and sailing on Ascension Day in great state to celebrate the union of Venice and the sea. The last doge was Lodovico Manin, who abdicated in 1797. Perhaps the best known were Andrea Dandolo, the conqueror of the Turks, and Marino Faliero, put to death for conspiracy, 1358. In Genoa the president was a doge from 1339 until the French conquest. At first he held office for life, but in 1528 the period was fixed at two years. See Venice: History.

**Dog Fish** (*Scyliorhinidae*). A group of fishes of the shark family, but mostly smaller in size. They have a cartilaginous skeleton, no



Dog Fish. Specimen of the *Mustelus canis*, an inhabitant of the North Atlantic

spines on the dorsal fin, and most of them have spotted skins. The mouth is on the under side of the head, and is provided with several rows of teeth. Distributed over the tropic and temperate seas, they feed on crustaceans and molluscs.

Several species, e.g. the greater (*Scyllorhinus stellaris*) and lesser spotted dog fish (*S. caniculus*), are common around the British coasts, and are detested by fishermen, as they interfere with the nets and steal the bait off the lines. The flesh, which is coarse and strongly flavoured, appears in the market under the name of rock salmon; the dried skin, known as shagreen, is used in wood polishing.

**Dog Gate.** Name given to a gate originally placed at the top of a flight of stairs to prevent the house dogs from invading the upper rooms. Victorian houses were frequently fitted with these gates on the nursery floor to stop children from going downstairs.

**Dogger.** Globular concretion occurring in oolitic and greensand rocks. At the base of the lower oolite in Yorkshire, doggers or cat-heads of sandy ironstone, worked for iron ore, give their name to the dogger series, which reappears in the middle brown Jura formation of N.W. Germany. In the Kellaway beds and greensand they are calcareous, in the coralline masses of fossil shells and corals.

**Dogger.** Dutch deep-sea fishing boat, about 80 tons. It is a large two-masted, ketch-like smack, used in the North Sea, particularly on the Dogger Bank. Its peculiarity consists in a well in the middle, in which the fish caught are kept alive until the boat reaches port.

**Dogger Bank.** Extensive sandbank in the North Sea, almost equidistant from England and Denmark, with a mean depth of from 60 ft. to 120 ft., a length of 150 m., and a breadth of 70 m. It is a noted fishing ground, especially for cod. On Oct. 21, 1904, during the Russo-Japanese War, a Russian Baltic fleet on its way to the Far East fired on some British fishing trawlers, sinking one and damaging others, and killing two and wounding several members of the crews. The tsar expressed regret at the accident, which was inquired into by an international commission, and compensation was duly made by the Russian government. Two battles have been fought here, one between the Dutch and English in 1781, and another in the First Great War.

**Dogger Bank, BATTLE OF THE.** Fought between the British and the Dutch, Aug. 5, 1781. France

and Spain were allied against Britain and had recognized the independence of the U.S.A.; Holland had joined the Armed Neutrality of 1780, and there was fighting in every part of the world. Admiral Sir Hyde Parker was in charge of the free movement of British trade in the North Sea. Early in Aug., 1781, he was returning from the Baltic with a large fleet of merchantmen. Zoutman, the Dutch admiral, also in charge of a merchant convoy, was northward bound, when on Aug. 5 he encountered Parker, southward bound, on the Dogger Bank. Parker sent his merchantmen home to England, while Zoutman kept his trading fleet at some distance to leeward.

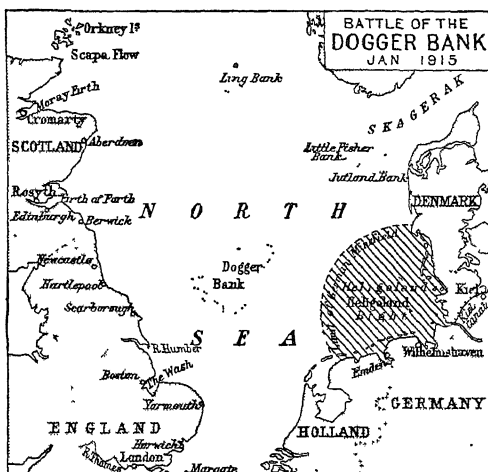
The opposing admirals both had scratch fleets, severally of seven ships, accompanied by frigates. Parker had only two of solid value, the *Fortunate*, his flagship, and the *Berwick*, both of 74 guns, while the best ships in the Dutch fleet

aded one another, each side being severely damaged, and then each withdrew to its own port without any conclusive results.

**Dogger Bank, BATTLE OF THE.** Naval engagement between the British and Germans, Jan. 24, 1915. On Jan. 23, 1915, the German battle cruisers Seydlitz, Moltke, and Derfflinger, the armoured cruiser Blücher, the light cruisers Graudenz, Stralsund, Kolberg, and Rostock, with 22 destroyers, left German waters to attack the British coast. That same day the whole of the British Grand Fleet left Rosyth and Scapa to carry out a sweep of the North Sea.

The Germans were sighted by British light cruisers, which had moved up from Harwich, about 160 m. W.N.W. of Heligoland, near the Dogger Bank, at 7.20 a.m. of Jan. 24. Their presence was signalled to Sir David Beatty, commanding the British battle-cruiser force, which consisted of *Lion* (flagship), *Princess Royal* and

*Tiger*, *New Zealand* and *Indomitable*, with eight light cruisers and about 26 destroyers. Beatty at once gave chase, gradually raising his speed to 28½ knots. At 8.52 he was within 20,000 yds. of the last German ship, the *Blücher*, and formed a line of bearing so that his guns could attack, and after testing shots, *Lion* at 9.9 made the first hit on the *Blücher*. A little later the Germans returned this fire, and the British began to make repeated hits. At 9.45, *Blücher* was

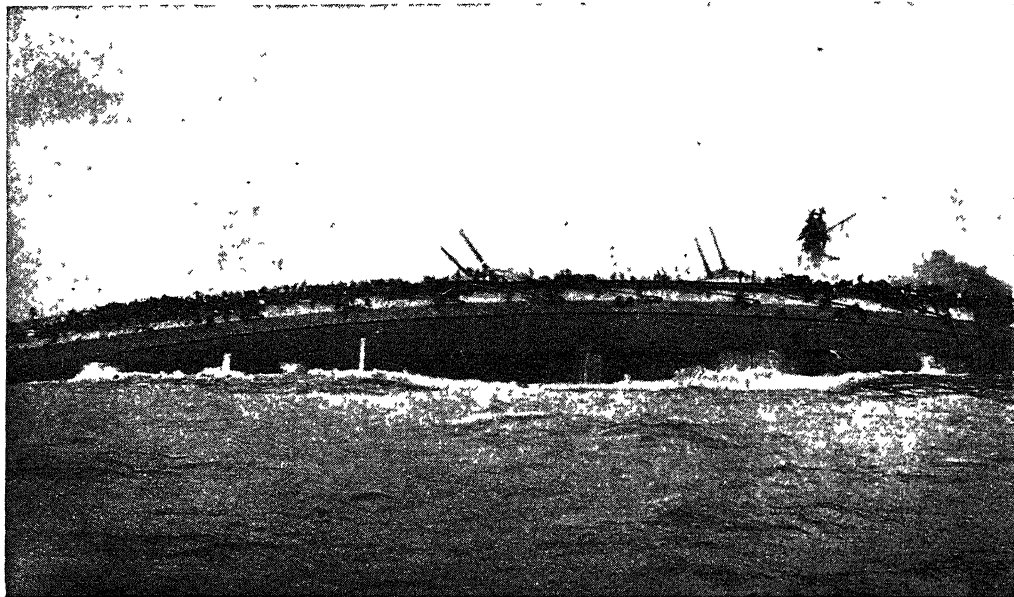


Dogger Bank. Map of the North Sea, showing position of the sandbank and extent of the German minefield

were the *De Ruyter* of 68, Zoutman's flagship, and the *Generaal Admiraal* of 74. The battle was fought on the established principles of the 18th century, which often led to inconclusive actions. The British fleet, which had the wind, was to bear down and each ship was to find its adversary. Parker laid his flagship alongside the *De Ruyter*. He had three ships ahead of him and three astern, while Zoutman in his line had four ahead and two astern. In this formal system of fighting, the leading Dutch ship was tackled by the *Berwick*, the second ship had no opponent, and all the other ships were engaged, except Parker's sternmost ship. For three and a half hours the fleets cannon-

dropping behind fast, much damaged, and the first and third German ships, probably Seydlitz and Derfflinger, were on fire.

At 10.48 *Blücher*, badly on fire, with a heavy list, dropped out of the line and turned N. She was abandoned by her sister-ships, as any other course would have meant their own immediate destruction. Beatty ordered *Indomitable*, which was dropping behind the other British ships, to attack her. *Blücher* was subjected to a heavy fire, but as she continued her resistance, the British light cruiser *Aurora* fired two torpedoes at her and sank her. Of her crew of 885, only 123 could be rescued, since a Zeppelin came up and



**Dogger Bank.** Sinking of the German armoured cruiser Blücher in the battle of the Dogger Bank, Jan. 24, 1915. Photograph taken from a British cruiser and purchased for £1,000 by The Daily Mail

attempted to bomb the light craft engaged in the work. The other British battle cruisers continued the pursuit, much hampered by a smoke-screen which the German destroyers put up.

Soon after 10 a.m. submarines were seen by the British and avoided; at 11.3 Lion was hit by two shells below the water-line, which put her feed-tank out of action and compelled her to leave the line. The rest of the fleet, under Rear-Adm. Moore, was ordered by Beatty to pursue and close on the enemy while he shifted his flag. It passed out of sight; when Beatty rejoined it in a destroyer at 12.20 p.m., it was returning, and he learnt that, though two of the German battle cruisers had shown signs of considerable damage, the battle had been broken off, about 90 m. from Heligoland, at a point "where dangers from German submarines and mines prevented further pursuit." This premature withdrawal caused surprise in the German fleet and led it to suppose that the British had suffered very severely.

Thus the battle ended in the escape of the three best German ships owing to the unfortunate injury to Beatty's flagship. The British casualties were 6 killed and 11 wounded in Tiger and 11 wounded in Lion, which latter ship was speedily repaired at Newcastle. In the German squadron Seydlitz lost 168 men killed by a single hit, which put two of her turrets out

of action and set her badly on fire. A second hit in her armoured belt astern caused a serious leak. Derfflinger was reported to have lost 260 killed and wounded, but the Germans stated that she was but slightly damaged.

**Doggerel** OR DOGGREL. Verse indifferent or mean in thought and faulty or worthless in construction. The term is also applied to burlesque verse, such as that of Butler's *Hudibras*. Doggerel was once used as a verb, implying frequent repetition of an argument.

**Doggett**, THOMAS (d. 1721). Irish actor. Born in Castle Street, Dublin, he first appeared in London at Bartholomew Fair. In 1691 he played *Nincompoop* in D'Urfey's *Love for Money* at Drury Lane, and, with Cibber, Wilks, and Swiney, managed The Haymarket during 1709-14, when, owing to a disagreement, Doggett separated from his partners, and acted intermittently at Drury Lane until his death. In Aug., 1715, he founded the race for the Doggett's Coat and Badge. Among Doggett's principal characters were: Fondlelove in *The Old Bachelor*, and Ben in *Love for Love*, both by Congreve, who greatly admired Doggett's acting; Tom Thimble in *The Rehearsal*; and the First Grave-digger in *Hamlet*. Doggett was the author of one comedy, *The Country Wake*, in which he himself took a part in 1696. He was well known for his social qualities in his day

### Doggett's Coat and Badge.

Prize annually competed for by Thames watermen in a rowing race. It was founded Aug. 1, 1715, by Thomas Doggett, who bequeathed a sum of money for it,

now controlled by the Fishmongers' Company. The course is from London Bridge to Chelsea, and the list of winners has been preserved since 1791. No races took place in 1915-19 owing to the First Great War: the suspended races were decided in 1920. In 1939 the course was covered in 28 mins. 39 secs. No races were held in the years 1940-46.



Doggett's Coat and Badge, the prize rowed for by Thames watermen since 1715

Drawing by C. G. Harper

**Dog Licence.** Tax imposed on all dog owners, with few exceptions, such as farmers, shepherds, and blind persons. Introduced in 1796, and again imposed in 1808, the tax has long been a regular source of revenue to the country. It has varied in amount from time to time, being 12s per dog in 1866, 5s. at a later date, and then 7s. 6d.

The number of dog licences in the U.K. in the year before the Second Great War exceeded 3,000,000. Puppies under six months are exempt from the tax.

**Dogma** (Gr. *dokein*, to hold an opinion). Word used of a statement or opinion regarded as true. Originally applied to the tenets of certain philosophers and to public decrees, being used in the Greek of the N.T. in the latter sense (Luke 2 and Acts 16), the word became generally restricted to statements of belief held by the Christian Church to be of divine revelation. In modern usage dogma is briefly a statement of revealed truth defined by the Church. All the principal dogmas of Christianity, the Trinity, the divinity of Christ, and the articles of the Apostles' Creed, are held by those who regard them as true to be of divine revelation in their origin and to have been defined by divine guidance.

Revealed truth does not become a formal dogma until it has been defined authoritatively by the Church. While the R.C. Church declares its dogmas to be unchangeable for all time it recognizes that revealed truth does not require to be defined until challenged by criticism, misinterpreted by lack of understanding, or liable to be stated erroneously. Hence the history of Christian dogma is the history of controversy demanding settlement. The claim of the R.C. Church to be the sole authority for definitions of dogma is not accepted by Anglicans, Nonconformists, or by the Eastern churches. Hence the dogmas of the Council of Trent, and of papal infallibility defined by the Lateran Council, 1870, are rejected outside the communion of Rome, and only those dogmas are retained which date from the early general councils of the Church.

Roman Catholics, while required to believe all defined dogmas of their church, maintain that these dogmas are defined because they are existing truths and are not truths created by definition. Dogmas are not restricted to revealed religion. Science also has its dogmas, i.e. statements considered to be proven by observation and by experiment.

**Dogmatism.** The positive assertion of doctrines or opinions; in philosophy, a system which goes beyond the sphere of experience, without having first tested the capacity and limits of the intellect. The dogmatist has implicit faith in the efficiency of human reason,

and lays down certain general principles as the foundation of his system. He is opposed to the sceptics and to the critical philosophers: the former doubted the truth and value of human knowledge generally, while the latter tested the limits of reason.

**Dogra.** People of Rajput stock in Kashmir, Jammu, and adjacent valleys. Mostly Hindu round Jammu, and Muslim farther W., about one-seventh of the population speak a Punjab Dogri dialect. The Dogra Regiment, raised locally, had a good record in the Second Great War.

**Dog Rose** (*Rosa canina*). Shrub of the family Rosaceae. A native of Europe, Siberia, and N. Africa, it is common in hedgerows and thickets, which it climbs by the aid of flattened hooks. The leaves are broken up into 5-7 oval leaflets with toothed edges; the sweet scented pink or white flowers are about 2 ins. across, appearing in June. The fruit is the familiar crimson hip, of which a syrup rich in vitamin C is made.

**Dogs, ISLE OF.** District of London, on the Thames, opposite Greenwich. It was originally a peninsula, its present character being due to the formation of the West India, East India, and Millwall docks, and the Limehouse and Blackwall basins. It constitutes a large portion of the borough of Poplar. The Island gardens, two and a half acres, were opened 1895. The footway tunnel to Greenwich starts from these gardens, while the entrance to the Blackwall Tunnel is near the East India Dock gates. Cubitts Town in the Isle of Dogs, having been almost wiped out by the air raids of 1940-41, became in 1945-46 the site of some 300 prefabricated houses, the first to be erected in London.

**Dog's-bane** (*Apocynum androsaemifolium*). Perennial herb of the family Apocynaceae, native of N. America. It has opposite, oval leaves and fragrant, nodding, bell-shaped flowers. These flowers, coloured pink, are well known for their five sensitive scales, which bend together when touched by an insect and detain it. The plant is acrid and poisonous.

**Dog's Mercury** (*Mercurialis perennis*). Perennial herb of the family Euphorbiaceae. A native of Europe, N. Asia, and N. Africa, it has a slender creeping rootstock and dark green oval or lance-shaped

leaves. The flowers are small, green, and inconspicuous, the males on separate plants from the females. Good King Henry (*Chenopodium bonus-henricus*) is cultivated as a pot-herb in some places under the name of mercury. See Chenopodiaceae.

**Dog Star** OR SIRIUS. Sirius (q.v.) in Canis Major and Procyon in Canis Minor were formerly called the dogs of Orion.

**Dog-tooth Ornament.** The name given to a small blunt-pointed ornament used in hollow mouldings. Early English architecture provides many examples, and some believe that it was brought from the East by the Crusaders. See Architecture; Moulding.

**Dog Watch.** Two-hour watches on board ship, that from 4 to 6 p.m. being called first dog, that from 6 to 8 p.m. second dog. The rest are four-hour watches.

**Dog Whelk.** Popular name of a common British mollusc, *Nassa reticulata*, which does great mischief to oyster and mussel beds. The name is incorrect, since the creature is not a whelk.

**Dogwood** (*Cornus sanguinea*). Shrub belonging to the family Cornaceae. A native of Europe and of N.W. Asia, it has opposite, entire, oval leaves and clusters of small cream-white flowers, which are succeeded by small black berries. The latter are round, very bitter, and yield an oil

which has been used for lamps and soap-making. The hard, tough wood is serviceable for many purposes where size is not required, such as rounds of ladders; the twigs are made into skewers, and the tonic and astringent bark provides a substitute for cinchona. In N. America the name dogwood is given to about 20 species of *Cornus*, e.g., *C. florida*, a lovely flowering shrub.



Dog's Mercury, leaves and fruits



Dog Tooth ornament, an architectural decoration



Dogwood leaves and berries

**Doherty, HUGH LAWRENCE** (1876-1919). British lawn tennis player. A Londoner, born Oct. 8, 1876, he was a schoolboy champion and played lawn tennis for Cambridge against Oxford, 1896-98. He won most of the singles titles; at Wimbledon, 1902-06, and in Scotland, Ireland, the Riviera, and the U.S.A. With his brother Reginald (1872-1911), the Wimbledon champion of 1897-1900, he won the doubles there 1897-1905. The two were supreme in their day, being the first to perfect the art of the smash.

**Dohnányi, ERNST VON** (b. 1877). Hungarian composer. The son of a professor, he was born at



E. von Dohnányi,  
Hungarian composer

Pressburg (Bratislava) July 27, 1877, and received musical training from the cathedral organist and at the Royal Hungarian Academy of Music, Budapest. In 1897 he was awarded a prize for his symphony in F. He appeared as a pianist in England, 1898, and in the U.S.A., 1899. Influenced at first by Brahms, his earlier compositions were predominantly classical in form, though marked by great brilliance and originality, e.g. Variations on a Nursery Song. His later style tended towards national romanticism, as in the ballet *Pierrette's Veil*, and the opera *Tower of Voivod*, 1922. Director of the conservatoire of Budapest, Dohnányi was imprisoned after the Axis defeat in 1945 on account of his fascist sympathies.

**Doine.** Lake or loch of Scotland. It is in Perthshire, 4 m. W.S.W. of Balquhider, and is separated from Loch Voil by a short stream. Its waters are carried through that and other lakes to the Teith.

**Doiran.** Town and lake of Macedonia, on the boundary between Bulgaria and Greece. The town is situated on the S.W. of the lake, about 40 m. N. of Salonica. It frequently figured during the First Great War in the operations of the Salonica expedition, and finally was captured from the Bulgars on Sept. 18, 1918, by British and Greek troops. Pop. normally about 4,000. Following the German invasion of Greece and Yugoslavia in 1941, Doiran was seized by the invaders on April 7. Occupied later by Bul-

garian troops, Doiran was liberated by the surrender of Bulgaria in Sept., 1944.

Lake Doiran is a circular body of water, about 5 m. long N. to S., and somewhat less E. to W., 10 m. E. of the Vardar river. It has an area of 15 sq. m. and is 500 ft. above sea level.

**Doisy, EDWARD A.** (b. 1893). American biochemist. Born at Hume, Ill., Nov. 13, 1893, he was educated at the university of Illinois and became professor at the St. Louis university school of medicine in 1923. Director of S. Mary's hospital in 1924, as a research worker he specialised in "blood buffers," in the isolation of hormones, and of the pure crystalline vitamin K. Together with the Danish professor, Henrik Dam, he was awarded the Nobel prize for medicine in 1943, after having been honoured since 1940 by numerous honorary degrees, medals, and awards for his discoveries.

**Doit or Duit.** Dutch copper coin, one-eighth of a stiver = 1d., now obsolete. It was used, although illegal, in England in the 16th century, and was current in Scotland, where it was worth 1d. Scots. The word is used generally for any tiny coin or anything of little value.

**Dol.** Town of Brittany, France, in the dept. of Ille-et-Vilaine. It stands in a level and fertile tract, 13 m. by rly. S.E. of St. Malo. An agricultural centre, it is a market for produce of the surrounding district, and is famous for its market gardens, while tobacco is also grown. Tanning is another industry. An old town, Dol was a bishop's see about 600 to 1790, the bishop being the spiritual head of all Brittany. The cathedral, a fine Gothic building, dating from the 13th century, is dedicated to the English S. Samson.

**Dolabella, PUBLIUS CORNELIUS** (c. 70-43 B.C.). Roman general notorious for his profligacy and extravagance. When tribune he actually introduced a bill for the cancellation of debts, which was quashed by Caesar. During the Civil War he changed sides twice, supporting first Pompey and then Caesar. After the murder of the latter, he joined the republican party, but abandoned it on being made governor of Syria by Antony. His extortion and violence and the murder of Trebonius (q.v.) led to his being declared a public enemy. Besieged in Laodicea, he evaded the penalty of his crimes when

the city was taken by causing one of his own soldiers to put him to death. His wife was Tullia, daughter of Cicero.

**Doldrums.** Name given by sailors to the low-pressure belt of equatorial calms; here the N.E. and S.E. trade winds meet, and very heavy rainfall and thunderstorms are often experienced. Owing to the apparent migration of the sun, the position of the Doldrums changes, being farthest N. in the northern summer, and farthest S. in the southern summer, although even then it does not completely cross the equator. Its mean position is N. of the equator.

**Dole.** Charitable distribution of money or food in small quantities. In the Middle Ages doles were established in perpetuity by the interest accruing from bequests of land or money. Such doles are still in existence, notably one at Hereford. The term was also applied in an unofficial sense to the allowance paid to the unemployed in Great Britain after the First Great War. The unemployment insurance scheme which came into operation in 1912 introduced the payment of unemployment benefit in return for the payment of premiums, and thus had no suggestion of unearned charity. In 1919, however, so many returning service men were unable to obtain work that the government provided for an unemployment donation for ex-service workless. In 1920 a new Act placed all unemployed persons on the same level, yet the word dole continued to be applied commonly but incorrectly to unemployment pay. See Labour Exchange; Insurance, National; Unemployment.

**Dôle.** Town of France, in the dept. of Jura. It stands on the river Doubs and on the Rhine-Rhône canal, 29 m. S.E. of Dijon. An old town, its chief buildings include the church of Notre Dame, the hôtel de ville, and the hôtel Dieu. The town is a centre for agricultural products, including wine. In the Middle Ages Dôle was in Burgundy, and for about 250 years the capital of Franche Comté, having then both a parliament and a university. It passed about 1479 to the house of Austria, and was taken by the French in 1674. Pop. 18,250.

**Dolerite** (Gr. *doleros*, deceptive). Coarsely crystalline rock, intermediate in texture between gabbro and basalt. It is composed of plagioclase, augite, and other minerals. The name was in

the past limited to greenstone found in tertiary lavas, the more weathered forms being called diabase. The toughness and other properties of dolerite give it value in road building.

**Dolet, ÉTIENNE** (1509-46). French scholar and printer. Born at Orléans, he studied in Italy, and became proof-reader for a Lyons printer, Sebastian Gryphius, who in 1536-38 issued Dolet's *Commentariolum Linguae Latinae*. In 1538 Dolet opened a press of his own at Lyons, but his views provoked ecclesiastical persecution and his business success commercial rivalry. He was burnt as a heretic in Paris, Aug. 3, 1546. A bronze statue to his memory by Guilbert was erected in 1889.



Étienne Dolet. Guilbert's statue of the French printer-martyr, in the Place Maubert, Paris

Dolet was burnt as a heretic in Paris, Aug. 3, 1546. A bronze statue to his memory by Guilbert was erected in 1889.

**Dolgelley.** Market town, co. town, and urban district of Merionethshire, Wales. It stands under Cader Idris, and is served by rly., being 9 m. E. of Barmouth. For the sake of its scenery it is visited by tourists. There are a grammar school, a market hall, and an assize hall. A weekly paper in Welsh is published. The town has a little fellmongering and wool trade. Market days, Fri. and Sat. Pop. 2,740.

**Dolichocephalic** (Gr. *dolichos*, long; *kephalē*, head). Term usually used of human heads and skulls whose breadth is less than three-fourths of their length. The long, narrow-headed form is found among the Nordic and Mediterranean types of the Caucasian race (Swedes, Berbers), as well as Hamites and Semites. With these the narrowness pertains to the frontal region. It is occipital in most others, including Dravidians, Papuans, Polynesians, Australian aborigines, Eskimos, and a primitive South American type (*Botocudos*). It prevails also in Negro, Bantu, and Bushman Africa. See Cephalic Index.

**Dolichos.** Group of edible pulses produced by different species of the family Leguminosae. They are natives of the tropical and temperate regions of Asia, Africa, and S. America. The principal of

these is *Dolichos lablab*, a native of India, a climbing herb with trefoil leaves and violet flowers, followed by flat rough pods containing a few seeds. When young they are eaten like kidney-beans, or the mature seeds are cooked like haricots.

**Dolin, ANTON** (b. 1904). Professional name of Patrick Healey-Kay, British dancer. Born at Slinfold, Sussex, July 27, 1904, he studied dancing with Astafieva, Nijinska, Legat, and Cecchetti, and appeared on the stage at the Princes Theatre, London, in 1916 in a children's play. In 1923 he danced as Daphnis in Daphnis and Chloe with the Russian ballet at Monte Carlo. Having toured in Spain, France, and Germany, he returned to London in revue. He was associated with the Camargo Society and the Vic-Wells company, and in 1935-37 toured with Alicia Markova (*q.v.*)—a dancing partnership which continued intermittently for many years. In

1939 with the Russian ballet, he appeared in *Le Fils Prodigue*. Dolin's *reminiscent Divertissement* was published in 1931, and his autobiography, which was entitled *Ballet Go-Round*, in 1938.

**Dolina.** Italian name for the funnel-shaped cavities giving communication with the underground systems of drainage commonly found in limestone regions. The name is used in the Karst region N. and E. of the Adriatic Sea. In the British Isles similar cavities are called swallow holes and sinks. See Karst; Pot Holes.

**Doll.** Toy representing a human figure. As a plaything the doll is of remote antiquity and universal distribution, though apparently least



Anton Dolin, British dancer



Doll. Ancient and modern examples of these toys. In the top row are an Egyptian doll (on left) and ancient Greek specimens in clay, terra-cotta, and rag. Those in the centre row are (left to right) English 18th century, and Dutch and English 19th century. Those in the bottom row are (left to right) Russian, British, and Japanese products of the 20th century



general in Asia. Dolls were common in Asia Minor; among the Arabs, in Egypt, where they are known to have existed in the 18th-17th century B.C., in Greece, and in Rome, where specimens have been found in the catacombs. They are common among all African tribes, Australian aborigines, Red Indians, and the Eskimoes, and while in some instances a certain magical significance is attached to them, generally they supply a natural want in the development of the human imagination.

The doll exists for the mature man as well as for the child. Lubbock, in his *Origin of Civilisation*, comments on the savage's fondness for such toys as dolls and Noah's arks, and even in so highly developed a civilization as that of Peru under the Aztecs dolls are said to have been the constant playthings of Montezuma and his court. It is usual to explain the pleasure derived by girls from dolls as a gratification of the maternal instinct. So many boys, however, pass through a stage of doll-love that this theory is not entirely satisfactory; moreover, girls almost without exception prefer girl-dolls to boy-dolls, while their affection for baby brothers and sisters is equal. Boys usually prefer boy-dolls.

This points to the human desire for companionship as the explanation of the child's love for its doll, combined with its early identification of self with its belongings. The child regards the doll, not as its child, but as its other self, and manifests its own self love towards it in many illuminating ways. Imagination imparts the warmth of life and love to the inanimate toy, and upon it the child lavishes its whole confidence and trust, deriving from it in return a satisfaction of love never impaired by a failure of sympathy and understanding, of which even a mother must sometimes be guilty simply because she is grown up. In this perfect companionship, not a whit less real because it is an illusion, and perhaps also in the gratification of some decorative instinct by the fashioning and putting on of garments which the child itself admires, the explanation of the doll's fascination is more probably to be found than in the more generally accepted theory of the gratification of the maternal instinct.

Dolls are, and have been, made from all sorts of materials variously stuffed, e.g. rags, leather,

china, and pot, wax, wood, and unbreakable compositions. The limbs are often dexterously jointed to assume any position; and other approaches to realism have included the use of real hair and eyelashes, movable eyes, and contrivances to simulate breathing or even speech.

**Dollar.** Name of a silver coin once widely current in Europe, now the unit of the monetary systems of the U.S.A., Canada, Mexico, and several S. American states; in these last it is now represented by the peso with a value of from 1s. to 2s. 6d. It descends from the thaler (*q.v.*), a standard coin in the 16th century. As the piece of eight the Spaniards introduced it into America, whence it, or its equivalent, spread to India, the Straits Settlements, China, Zanzibar, and Abyssinia, where Maria Theresa dollars are still highly valued. In 1797, owing to the scarcity of English coins, the British government reissued Spanish dollars, with plate-marks or the letters G.R. in a shield.

Today the standard dollar is the American coin adopted by the U.S.A. in 1792, and the unit of currency until 1873, when a gold standard was adopted. The silver dollar weighs 4.125 grains, .900 fine. The U.S. gold dollar weighed 25.8 grains (or 1.6718 grammes), .900 fine. The currency of Canada, including Nova Scotia, New Brunswick, British Columbia, and Newfoundland, is based on the U.S. dollar and similarly divided into 100 cents. The dollars now in use in the U.S.A. are paper currency, called "greenbacks." See Eagle.

**Dollar Area.** Term loosely used for those countries whose currencies are closely linked with that of the U.S.A., e.g. Canada and the S. American republics. See Sterling Area.

**Dollar Princess, THE.** Comic opera adapted from the German of A. M. Willner and F. Grünbaum by Captain Basil Hood, composed by Leo Fall, and produced at Daly's Theatre, London, Sept. 25, 1909, where it had a run of 430 consecutive performances.

**Dollart, THE.** Arm of the sea, really a widening of the estuary of the Ems. It is 10 m. long and about 7 m. broad. The port of Emden lies a few miles from the E. shore. The Dutch asked for its cession to the Netherlands after the Second Great War, with the object of draining it except for a channel, to be kept navigable jointly by the Dutch and the Germans. See Ems.

**Dollfuss, ENGELBERT** (1892-1934). Austrian statesman. Of peasant stock, he was born at



E. Dollfuss,  
Austrian statesman

Texing, Lower Austria, Oct. 4, 1892, and was educated at Vienna university, where he studied law, and at Berlin. Having served with distinction in the First Great War, he entered politics and eventually led the Christian Social party—equal in numbers with the Socialist, but with considerably greater power. Minister of agriculture, 1930, after the collapse of the Credit-Anstalt and the disorganization of Austrian finances, he was appointed chancellor in May, 1932. He staved off collapse and set himself the task of attempting to restore prosperity. Nicknamed the "pocket chancellor," because he stood less than 5 ft., he was assiduous in attending economic conferences abroad, but in competition with Nazi activities embarked upon a campaign of repression against Socialism from which his reputation did not emerge unscathed. His main ally against the Nazis was the Heimwehr, a semi-fascist para-military organization led by Fey and Starhemberg; the price of its assistance was the crushing of the powerful Social Democrat party. This led to an attempt upon Dollfuss's life, Oct. 2, 1933, and culminated in the outbreak of Feb., 1934, in Vienna, Graz, and Linz. The Vienna revolt was suppressed only after severe bloodshed and several days of bitter fighting. Dollfuss, with the help of the Heimwehr, continued to resist Nazi encroachment, but was assassinated, July 25, 1934, by a Nazi band led by Otto Planetta during a frustrated "putsch" meant to bring Austria under Hitler's rule.

**Dolling, ROBERT WILLIAM RADCLYFFE** (1851-1902). A British clergyman and social worker. Born Feb. 10, 1851, at Magheralin, co. Down, he came into prominence as a social worker in Dublin. He was warden of the S. Martin's League of postmen, in London, 1879-82. After taking orders he had charge of S. Martin's Mission, Stepney, 1883-85. His chief work was carried out as vicar of S. Agatha's, Landport, 1885-96, in connexion with the Winchester College Mission. In ten years he raised £50,000 for this work,



before he resigned on the question of ritual. Father Dollinger's large-hearted evangelism endeared him to the poor. During 1898-1901 he was vicar of S. Saviour's, Poplar, where his chief work was on behalf of the children. His health broken by overwork, he died May 15, 1902, and was buried at Woking. A Dolling Memorial Home for working girls of Landport and Poplar was opened at Worthing, 1903. *Consult* his *Ten Years in a Portsmouth Slum*, 1896.

**Döllinger, JOHANN JOSEPH** IGNAZ VON (1799-1890). German theologian. Born at Bamberg, Bavaria, Feb. 28, 1799, and educated at Würzburg, he became a Roman Catholic priest. In 1826 he was appointed to the chair of ecclesiastical history at Munich, where he vigorously attacked Protestantism. In 1861 he began to lecture against the temporal sovereignty of the pope; and when the Vatican council in 1870 proclaimed papal infallibility, Döllinger refused to accept the decree. For this he was deposed from the priesthood and excommunicated. He was sympathetic towards the Old Catholic movement, and presided over the conference of Bonn in 1874. In his closing years he laboured much to promote unity among the various churches. Of his historical and controversial books the most famous was *The Pope and the Council*, 1869, issued under the pseudonym of Janus. Döllinger died at Munich, Jan. 10, 1890. His *Life* was written by J. Friedrich, 1899-1901.

**Dollmann, FRIEDRICH** (1882-1944). German soldier. As an artillery expert he served with the "Big Bertha" battery during the First Great War. He held a succession of staff appointments and was promoted general of artillery in 1936. Dollmann commanded the German 7th army that broke through the Maginot Line in 1940, and after the fall of France organized the defences and long-range batteries on the Channel coast. He was killed on June 27, 1944, while commanding an army in Normandy.



John Dolland,  
English optician  
From a portrait in  
the Royal Observatory,  
Greenwich

**Dolland, JOHN** (1706-61). English optician. Born June 10, 1706, of Huguenot parents, in Spitalfields, London, he was brought up to his father's trade

of silk weaving, but studied many subjects, including Latin, Greek, optics, and astronomy. In 1752 he joined his eldest son Peter (1730-1820), who had set up as an optician, and began to apply his theoretical knowledge to practical work. His great achievement was the invention of the achromatic telescope, which gained him the Copley medal of the Royal Society in 1758. He died Nov. 30, 1761.

**Doll's House, A.** Prose drama by Henrik Ibsen, produced at Christiania (Oslo) in 1879. The English adaptation by William Archer was produced at the Novello Theatre, London, in 1889. The play led to considerable discussion on the problems of a married woman's life with which it deals, and to a wide recognition of its author's position as one of the chief dramatists of the age.

**Doll's House, QUEEN MARY'S.** A miniature house, perfect in every detail, at a scale of one in. to the foot, designed for Queen Mary in 1924 by Sir Edwin Lutyens, and furnished and decorated by leading commercial firms and notable artists. It was exhibited at the British Empire Exhibition at Wembley in 1924, and later was on view in many places in aid of charities in which Queen Mary was interested. It was then permanently installed at Windsor Castle. *See* illus. in next page.

**Dolman** (Turk, *dolaman*, long robe). Short jacket slung from the shoulders, with the sleeves hanging loose, worn formerly by the Hussars. The custom is said to have arisen from an incident of battle when a regiment had only time to put one arm into the sleeve of their coats. Women adopted a similar garment towards the end of the 19th century, and called it by the same name. *See* Costume.

**Dolmen.** Megalithic chamber comprising an unhewn capstone upon two or more uprights. In Great Britain, it is frequently called a cromlech, and incorrectly a Druid altar. Though originally covered with earth or stone, many became exposed in early recorded times. Infrequent in England (Lanyon Quoit, Cornwall; Chagford, Dartmoor), they are commoner in Wales (Arthur's Quoit, Swansea; Pentre Ifan, Pembroke; Plas Newydd, Anglesey) and rare in Scotland. In Ireland more than 800 are enumerated (Kernanstown, co. Carlow, with a 100-ton capstone; Legananny, co. Down).

Out of the simple dolmen developed the corridor-tomb or passage-grave, of which there are

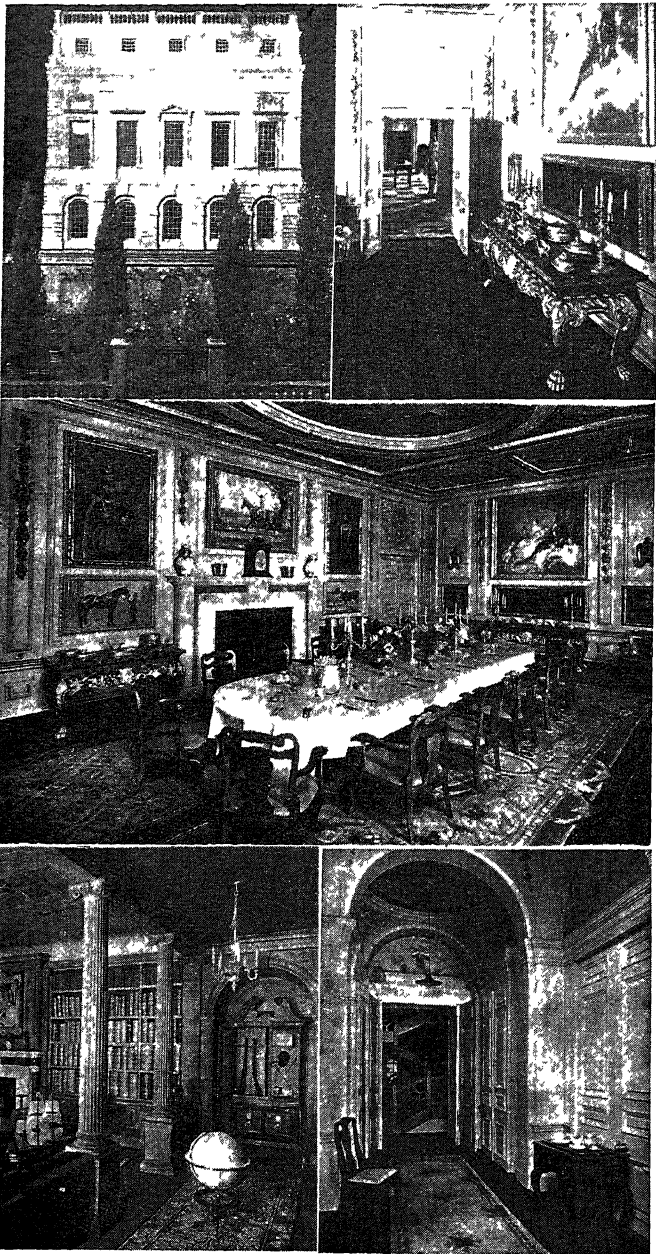
examples in Kit's Coty House, Kent; Wayland Smith's cave, Berks; and King Orry's grave, Isle of Man. There are still 4,458 dolmenic tombs in France; many in Holland, Scandinavia, Portugal, Spain, and the whole Mediterranean basin. Many thousands remain in N. Africa, with outlying survivals on the upper Nile (Madi) and W. Africa (Gambia). Eastward they extend over Ammon and Moab to India, the Malay Archipelago, Korea, and Japan. The word dolmen, of Celtic origin, is explained as meaning either stone table (*dol, tol*, table; *men*, stone), or a stone with a hole (*doll, toll*) underneath. *See* Cromlech; Stone Monuments; also Carnac illus.

**Dolmetsch, EUGENE ARNOLD** (1858-1940). French musician and instrument maker. The son of a Swiss piano-forte maker, he was born at Le Mans, Feb. 24, 1858. He learnt wood working and piano-forte making in his father's workshop, and studied at the Brussels conservatoire under Vieuxtemps, and at the Royal College of Music in London. Music master at Dulwich College, his original methods of group instruction brought him into public notice. In 1889 he began researches into early keyboard music, collecting and restoring virginals, viols, clavichords, etc., and giving his first recital of pre-Corelli string music in 1891. After some years in the U.S.A., he returned to England in 1914, the year in which he published *The Interpretation of the Music of the 17th and 18th Centuries*. Moving to Haslemere, Surrey, with his family (all skilled performers), he started annual festivals there in 1925. In 1928 the Dolmetsch foundation was inaugurated for the training of scholars and craftsmen to meet the demand for Dolmetsch instruments. The founder, who was granted a civil list pension in 1937, died Feb. 28, 1940.



Arnold Dolmetsch,  
French musician

**Dolomite.** Mineral composed of calcium magnesium carbonate ( $\text{CaMg}(\text{CO}_3)_2$ ), but generally having part of the magnesium replaced by iron and manganese. The ration of calcium to magnesium is not strictly constant. Crystals are often rhombohedral with curved faces. The colour is generally white to reddish. Dolomite differs



Doll's House, made for Queen Mary in 1924, and kept at Windsor Castle. The pictures show the exterior and the exquisite miniature interior fittings and decoration, all to scale at one inch to the foot, in dining-room, library, and queen's wardrobe. See previous page

from calcite in that it does not effervesce readily in cold acid.

The massive form of dolomite is of much greater importance than the crystalline mineral. Massive dolomite and dolomitic limestones constitute extensive strata; the Dolomite Alps of the Tyrol cover

hundreds of sq. m., and Permian magnesian limestones are common in England. Some dolomites have been formed by direct deposition from sea water; many from the interaction of magnesium salts; others from various processes which have transformed original

rocks (generally limestones) into dolomite.

Dolomite is used extensively for refractory purposes in the basic processes of steel production. It may be used for extracting magnesium metal and making basic magnesium carbonate, and with asbestos for heat-insulating. A special kind with magnesia makes Vienna lime, a compound for buffing metals. Other applications are as a flux in metallurgical processes and a building stone. Most countries have supplies.

**Dolomites.** Division of the Alps, Italy, in Venezia and Venezia Tridentina. They extend N.E. from Trent to Monte Cristallo, and culminate in Mt. Marmolada, 10,979 ft. Of limestone formation, they are distinguished by their jagged peaks, steep precipices secluded valleys, and magnificent scenery. The mineral dolomite (*v.s.*) is named from them.

During the First Great War the Dolomites, with part of the Julian Alps, formed virtually a single front on the Italian sector. In the general advance of May, 1915, the Italians failed to reach their objective, the Pusterthal rly. On Nov. 7 they reached Col di Lana, but were obliged to abandon it sixteen days later. In Oct. the Italians had crossed the Austrian frontier at Pontebba but could not cut the Tarvis rly. line. In Sept., Monte Rombon was taken and the Austrians evacuated the Plezzo valley, but the Italians were never able to reach the Austrian rly.

**Dolores.** Town of Argentina, in the prov. of Buenos Aires. It is about 130 m. by rly. S.S.E. of the capital. In its public gardens there is a fine monument to Liberty, identical with that in the Plaza de Mayo in Buenos Aires. Founded 1818, the town has law courts and a national college. There is trade in fruit and grain. Pop. 25,000.

**Dolphin** (Gr. *delphis*; Lat. *delphinus*). Name applied generally to a group of the smaller cetaceans, including the porpoise, narwhal, white whale, and the killer; but more properly to the genus *Delphinus*. This genus includes those species which have distinctly developed beaks, formed by a prolongation of the skull, and armed with some 40 to 60 teeth. The head has a bulbous appearance, due to the presence of a mass of blubber in front of the forehead. The eye is fairly large and conspicuous, but the external ear is a mere pinhole. The skin is black on the back, striped with greyish yellow on the

flanks, and white beneath. In length the dolphin varies from 8 ft. to 10 ft. Like all cetaceans, it is not a fish but a mammal, and produces one at a birth.

The common dolphin (*Delphinus delphis*) abounds in the English Channel, and does damage to the herring and mackerel fisheries. It is always found in herds, and is in the habit of following ships. The white-beaked dolphin is a rather rare visitor to British shores. The bottle-nosed dolphin, also rare, has occasionally been found in the Thames and around the coast. The white-sided dolphin has been taken a few times off the Orkneys.

**Dolu.** Town of Central Africa, in Bornu, Cameroons. It is situated 100 m. S. of Lake Chad and 130 m. S.E. of Kuka. Pop. 35,000.

**Dom.** Tribal name of several menial peoples in India. They numbered perhaps a million, besides those classed as Dommara, Bansphor, Basor, and Mirasi. The Bihar and Orissa Magaiyas are vagrants, the central Indian Bansphors bamboo-workers, the Himalayan Doms scavengers, the Punjab Mirasis minstrels. Mostly of aboriginal descent, their animism is partly Hinduised.

**Dom.** Mt. of Switzerland, in the canton Valais. In the Lepontine Alps, it is the culminating point of the Mischalbelhörner, between the valleys of Zermatt and Saas. Alt. 14,935 ft. The first to ascend it was the Rev. J. L. Davies in 1858.

**Domagk, GERHARD.** German pathologist. He discovered, and described in 1935, the drug prontosil, for use against streptococcal infections, puerperal fever, etc. Appointed professor of pathology and anatomy at Münster in 1937, he developed his discovery in parallel with French developments in the sulphanilamide field and with British ones producing M. & B. 693, in the Elberfeld Bayer laboratories of I.G. Farbenindustrie. Awarded the Nobel prize for medicine in 1939, he was prevented by Nazi legislation from accepting it.

**Dombaas.** Railway junction in Oppland co., S. Norway, where the Oslo-Trondhjem and Oslo-Aandsnes rlys. meet 90 m. S. of Trondhjem and 160 m. N. of Oslo. At the entrance to the Gudbrandsdal valley, it was the scene of fierce fighting in April, 1940, when 200 German troops landed by parachute and attempted to destroy the junction. Later Norwegian forces counter-attacked to regain the town and were joined by British troops. In face of strong enemy attacks the

Allies on May 1, 1940, evacuated the whole area. See Norway.

**Dombey and Son.** Charles Dickens's sixth novel. Originally issued in monthly parts (Oct., 1846–April, 1848), with illustrations by Phiz, the full title being *Dealings with the Firm of Dombey and Son, Wholesale, Retail, and for Exportation*, the story was intended to illustrate the evil consequences of pride as its predecessor, *Martin Chuzzlewit*, had illustrated those of selfishness. Mr. Dombey, the central character, is a prosperous city merchant, obsessed to the exclusion of other emotions by pride in his young son Paul as his potential successor as head of the firm. The story of the boy's early death and the dispelling of the father's dream is one of Dickens's most moving episodes, but the subsequent plot concerning Dombey's second marriage and eventual downfall is generally considered somewhat melodramatic. The neglected daughter Florence is an appealing character, but most readers return to the book for the rich humour of Captain Cuttle, Major Bagstock, Mr. Toots, Susan Nipper, Jack Bunsby, Dr. Blimber, and many other comic characters.

**Dombrowski, JAN HENRIK** (1755–1818). Polish soldier. Born in Aug., 1755, he served in the army of the elector of Saxony, and there won his reputation. In 1791 he returned to Poland, and was one of the leaders of the Poles in their resistance to the Russians and Prussians during the final partitions. He was next in Italy, where he led a corps of Poles in the interest of France. He held commands under Napoleon 1806–13, being in the invasion of Russia and at Leipzig. At the peace of 1815 he was given a high position in the army of Poland, then under Russian rule. Died June 26, 1818.

**Dome.** Term denoting the form presented by stratified rocks when folded by pressure so as to dip in all directions from a central point. Its antithesis is called a basin. A dome is therefore the shortest possible anticlinal, which normally comprises a ridge between two half-domes. The Westmorland lake district is an immense denuded dome. Analogous structures in igneous rocks are called volcanic domes. In crystallography the term denotes the gable-like termination of some forms of lateral prisms. See Rock.

**Dome** (Lat. *domus*, a house; cf. Ger. *Dom*, and Ital. *duomo*, a cathedral church). Name given to a spherical roof over a circular or polygonal building. The sphere,

like that of the cupola (*g.v.*), may be one of several varieties, but semicircular, semi-elliptical, and bell-shaped domes are the most common. The dome was a development of the arch principle of construction, and as such was largely employed by the Romans. One of the most famous domes in the world is that of the Pantheon at Rome, completed in the reign of the Emperor Hadrian (c. A.D. 123). It is built of solid concrete, is lighted by a small, circular opening or eye at its summit, and measures 142½ ft. in diameter. Roman domes were applied exclusively to circular buildings.

It remained for the Byzantine builders to place a circular dome upon a square or rectangular structure. This they accomplished by means of pendentives, or fan-shaped corbels, which were introduced at the angles of the square, so as to form a circular base for a round dome. The Byzantines also invented the "drum," or cylindrical dwarf tower, round which they grouped the windows that lighted the dome, and thus obviated the necessity of breaking the curve of the dome itself by openings. Most of the domed Christian churches of the Middle Ages are constructed on the Byzantine plan, with the great central dome crowning the middle portion of a Greek or Latin cross. The dome of the mosque of S. Sophia, Istanbul, measuring 107 ft. in diameter; the great dome of the Tomb of Theodoric, at Ravenna, which is hollowed out of a single block of stone; and that of the octagonal church of S. Vitale, at Ravenna, were all built in the 6th century.

Famous domes of the later Middle Ages are those of S. Mark's, Venice, and S. Sophia at Salonica, while the domes of S. Peter's, Rome, and of S. Paul's, London, the latter based upon the former, may be classed together as products of the late Renaissance. Wren's famous creation is only 100 ft. in diameter, as against 139 ft. of its exemplar. It is a first principle of domical construction that the dome should stand by itself, the materials keeping their place by their own gravity. In practice, however, it is frequently ribbed with iron or timber. Modern domes are often constructed iron, notable examples of such structures being the domes of the British Museum, and the Capitol at Washington. The dome of the Invalides in Paris (318 ft.) is built of timber and lead. See Architecture; Cathedral.

**Domenichino** (1581–1641). Italian painter, whose real name was Domenico Zampieri. He was born at Bologna on Oct. 21, 1581, and studied with Calvaert and the Carracci. Removing to Rome, he assisted Annibale Carracci in the decoration of the Farnese palace. His increasing reputation aroused such malignant hostility among his brother painters that he went back to Bologna, but at the summons of the pope he returned to Rome in 1621, when he painted the Martyrdom of S. Sebastian for S. Peter's. In 1630 he settled in Naples, where he executed the decoration with frescoes of the Cappella del Tesoro. Here the animosity of the local painters was so bitter that when Domenichino died suddenly at Naples, April 15, 1641, it was said that he had been poisoned.

Domenichino's reputation rests chiefly on his frescoes. His masterpiece in this medium is the series of paintings in the Chapel of S. Cecilia in S. Luigi de Francesi, Rome, representing scenes from the life of the saint. His greatest oil-painting is *The Last Communion of S. Jerome*. See Cecilia illus.

**Domesday Book.** Survey of the land of England, drawn up in 1086 by order of William the Conqueror. The information was obtained by sending officials into each county. From each village or manor came the priest and four villagers, and after interrogating them the officials noted down the facts. These were entered on rolls, and from these the book itself is compiled. From it the four northern counties are excluded, as are London, Winchester, and other towns, but for a different reason.

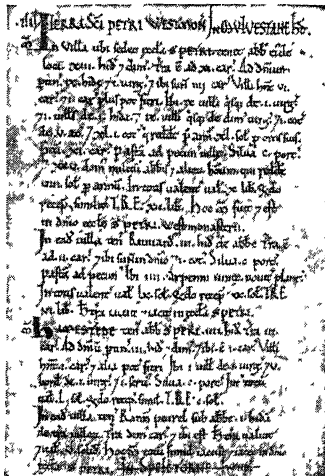
The book was intended by William to be a record of his rights, i.e. of the income to which he was entitled, and the information collected was all directed to this end. He wanted to know how much each place could and should pay, either by way of gold or land tax, or by way of rents and other dues. In each county the first entries are those of the king's own lands, then come those of the lands held by the religious houses, abbeyes, bishops, etc., then those of lay tenants-in-chief, and finally those of others. Most of the entries state what the land was worth in the time of King Edward (Edward the Confessor) in 1066, what it was worth when its present owner received it, and what it was worth when the book was compiled. In each was given the amount of arable land, the number of villeins, cottars, and other workers, the number of ploughlands and oxen, and particulars about churches, mills, fisheries, etc.

There is also a good deal of miscellaneous information, throwing light on various local customs.

The following is the entry in Domesday about Westminster, then a rural area:

In the villa, where is situated the church of S. Peter, the abbot of the same place holds 13½ hides. There is land for 11 plough teams. To the demesne belong nine hides and one virgate, and there are four plough teams. The villeins have six plough teams, and one more might be made. There are nine villeins with a virgate each, one villein with a hide, 9 villeins with a half virgate each, one cottar with five acres, and 41 cottars rendering a shilling each yearly for their gardens. There are 25 houses of the abbot's soldiers and of other men, who render is a year or £10 in all; when he received them the same; in the time of King Edward £12.

The book is of supreme value for the economic conditions and social history of the time, and much study has been spent on it. A number of theories have been based upon Domesday and many estimates made from it. In it the number of villeins enumerated is 108,000, of borderers 12,000, of cottars 23,000, and of free men 12,000. One calculation is that about 5,000,000 acres were then under the plough. The original book is in the Public Record Office, London. It was kept first at Winchester, being afterwards for a long time at Westminster. It was printed and published in 1783, and photographic facsimiles have appeared for each county.



Domesday Book. Facsimile of entry, translated above, relating to Westminster.

From the original in the Public Record Office.

During the Second Great War, Domesday Book was stored for safety in the prison at Shepton Mallet Som. See Danegeld. Feudalism. Manor *consuili* also Domesday Book and Beyond F. W. Maitland, repr 1907

**Domestication.** Process of accustoming animals and plants to live and propagate under human control. It involves control of mating; provision of food; protection from adverse environment, climatic and animate; and training to specialised services. It has endowed mankind with constant food, clothing, means of transport, and companionship. It was practised before written history began but was apparently unknown to palaeolithic man.

**ANIMALS.** When breeding in captivity is lacking, as with the elephant, the human control is preferably called taming. The dog may have domesticated itself in early neolithic time under dingo or pariah dog conditions, as shown by Danish kitchen-middens; breeding for herding and hunting came later in central Asia and Egypt. The origin of domestic cattle, sheep, and goats is more obscure. Segregation for ritual purposes, with sacrificial milking, offers the likeliest explanation. The horse, a palaeolithic food-animal, may, like the ass, have been tamed on Eurasian grasslands for milking prior to its use for transport and riding, just as the camel was under desert nomadism. The pig may have reached neolithic lake-dwellings in Europe from Transcasian oases.

Under the early metal cultures control was extended to such useful animals as the cat, cheetah, silkworm, domestic fowl, and bee. The domestication in America, in late pre-Columbian times, of the llama, alpaca, turkey, and even the cochineal insect, is best explained as a secondary effect of the migration of ideas across the Pacific. The variability of species under domestication, exhaustively studied by C. Darwin, brought about unforeseen structural modifications which have culminated in the triumphs of modern systematic breeding. See Animal; Evolution.

**PLANTS.** The unforeseen germination of refuse seeds and rootlets round the primeval homestead may have suggested the first rudimentary tillage. Deliberate seed-sowing upon grave-mounds belongs to a later psychology. The domestication of edible grasses and pulses, bringing in its train the hoe, sickle, plough, wagon, irrigation, quern, bread, beer, and village life, was a neolithic invention, not yet definitely localised. Transcasian oases and Swiss lake-dwellings have yielded three varieties of barley, two of millet, and three of wheat; in W. Asia vine and olive were under early cultivation. Neolithic flax, the first woven fibre, preceded cotton cultivation in

Asia by several millennia. The invention of metallurgy, by facilitating timber-cutting, fostered the development of meadow, field, and orchard, and made the Mediterranean basin and the Nile and Euphrates valleys a home of ever-advancing agriculture. These ideas penetrated to Bantu Africa and S.E. Asia. Crossing the Pacific, they were the originating impulse of the ancient civilizations based upon settled tillage in America, whose staple pre-Columbian cereal was maize. *See Botany.*

**Bibliography.** Variation of Animals and Plants under Domestication, C. R. Darwin, 2nd ed. 1875; Origin of Cultivated Plants, A. L. L. P. de Candolle, 1884.

**Domestic Science.** Term of American origin commonly used for the study of domestic economy, *i.e.* the various processes which go to the good ordering of a home or other place of residence. There are schools and training colleges for students and intending teachers of domestic subjects in London and other centres of the U.K. Bristol university gives a degree course in domestic science (B.Sc.). Domestic science subjects (*e.g.* cookery, laundry, needlework) are in the curriculum of most girls' schools.

**Domestic Servant.** Paid male or female worker employed in household duties. Domestic service for both men and women is one of the oldest occupations. In the ancient societies of Egypt, Greece, and Rome, the paid domestic servant existed side by side with the household slave.

With the abolition of slavery in Europe, the number of domestic servants increased and, mostly drawn from peasantries accustomed to existing on small wages, were the lowest paid class of the community. In time the servant communities employed in the average households of the well-to-do developed social strata of their own, ranging from the butler, housekeeper, and cook, to the bootboys and kitchenmaids.

Following the industrial revolution and the rapid expansion of population, the number of women domestic workers in Britain greatly increased. There was a large surplus of women who, through lack of opportunity in industry, were ready to take domestic employment. Concurrently a new urban middle class built the large town houses which only cheap servant labour could run.

At the beginning of the 19th century, domestic service in Great Britain was numerically the most

important paid occupation for women, providing a living for more than half of the total of women gainfully employed. By 1880 there were in Great Britain 130 female domestic servants for every 1,000 of the population.

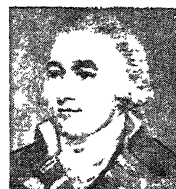
In the 20th century wider opportunities of livelihood presented themselves for women in industry and in all industrialised communities women became speedily more reluctant to enter domestic service. Between 1911 and 1921 the number of women in domestic service in the U.K., for instance, declined by 20 per cent. The Second Great War, with conscription and direction of women, further aggravated the position, but in Feb., 1946, the ministry of Labour announced the formation of an experimental national institute of houseworkers.

In English law domestic servants are entitled to a month's notice or a month's wages in lieu thereof. They must give the same notice or pay the same amount. The value of their board and lodging is not taken into account in England. They are insurable for industrial injuries and under the National Insurance Act. They are, like other servants, liable for negligence, though not for any little act of carelessness. A mistress has no right to search a servant's box without a magistrate's warrant, but a domestic servant can be summarily dismissed for disrespect, disobedience, or bad conduct, such as drunkenness or immorality. *Consult The English Abigail.* D. Stuart, 1946.

**Domett, ALFRED** (1811-87). British colonial statesman and poet. Born at Camberwell Grove, London, May 20, 1811, and educated at St. John's College, Cambridge, he was called to the bar at the Middle Temple, 1841. In 1842 he went to New Zealand and his absence moved his friend, Robert Browning, to the writing of the poem Waring. In N.Z. Domett entered public life, being secretary in 1851 and in 1862 prime minister. He returned to London in 1871. He published his first volume of verse in 1833, and the poem, Venice, in 1839, contributing meanwhile to Blackwood's Magazine. After his retirement he wrote further poems, Ranolf and Amohia, 1872; and Flotsam and Jetsam, 1877. In 1880 he was made C.M.G. He died Nov. 2, 1887.

**Domett, SIR WILLIAM** (1754-1828). British sailor. Entering the navy at the age of 15, he was promoted to lieutenant in 1777. He was present at the action off

Ushant (1778), Chesapeake (1781), St. Kitts (1782), and Dominica (1782), after which he returned with dispatches to



Sir William Domett,  
British sailor

England. He was at the relief of Gibraltar and the battle of Cape Spartel. In 1793 war broke out with France and Domett was, as he had been in 1783, flag-captain to Sir Alexander Hood in the Royal George, seeing action in the battles of June 1, 1794, and Lorient (1795). He helped to settle the mutiny at Spithead (1797). In 1801 he served in the Baltic, in 1804 was promoted rear-admiral, and in 1813 became commander-in-chief at Plymouth. Knighted in 1815, and made admiral in 1819, he died May 19, 1828.

**Domfront.** Town of France. It stands on the Varenne in the dept. of Orne, 43 m. N.W. of Alençon. Famous historically, it had in the Middle Ages a strong castle, built in the 11th century for the protection of Normandy. Some ruins of this remain. The town, which has an 11th century church, takes its name from S. Front, a hermit who settled here in the 6th century.

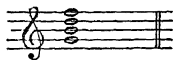
**Domicile** (Lat. *domus*, a house). Place of legal (usually also habitual) residence. Domicile is decided by international law. A man's first domicile is that of his origin, which depends on his father. When he attains majority he can make a domicile of choice, and is held to be domiciled where he resides, if he intends to remain there, making it his house.

On giving up a domicile of choice a man reverts to his domicile of origin until he has acquired another domicile of choice. A married woman's domicile is that of her husband. Usually only the court of the husband's domicile can grant a divorce. A woman ranking as a British subject whose husband goes abroad and deserts her can nevertheless obtain a divorce in Great Britain, and special provision was made in the Second Great War to enable British wives of foreigners to obtain divorces in Great Britain.

**Dominance.** In genetics, the development of one character in an individual whose genetic constitution also contains the latent capacity for producing a character of contrasting kind. Which of the two characters shall appear can be determined only by breeding

experiment. When a pure bred tall pea plant is crossed with a pure bred dwarf pea plant, the offspring are all tall plants. Dominance is here the development of the tall character, despite the fact that one of the parents was dwarf and should presumably pass that character on. That dwarfness is passed on and is merely latent in the offspring may be shown by fertilising the seeds of one of them with its own pollen. Some of the plants which grow up from those seeds will be dwarf, so the tall offspring must have transmitted the dwarf character of one parent although they resembled the other in being tall.

**Dominant** (Lat. *dominare*, to rule). In music, the fifth degree of the major or minor scale; e.g. in key C the dominant is G. The chord of the dominant seventh fixes the key; for example, in the B (♯) shows it is not key F,



while in the F (♭) shows it is not key G. Under normal conditions, it must be key C, which alone possesses B and F in its unaltered scales. It is also a central or dominating note in the older modes (*q.v.*).

**Dominic, SAINT (1170-1221).** Founder of the Dominican Order of Friars Preachers. His name was Dominic de Guzman, and he came of an old Castilian family, being born in 1170 at Calahorra, Spain. He was ordained about 1195, and became an Augustinian canon at Osma in Castile. He was charged by Pope Innocent III with a mission to the Albigenses in the S. of France in order to bring them back to Catholicism. In this work he displayed remarkable zeal, and proved himself an eloquent and fervent preacher.

In order to continue this work he founded in 1216 an order of preaching friars, who at first adopted the Augustinian rule and later received papal sanction as the

Order of Friars Preachers, since generally known as Dominicans (*q.v.*). Later S. Dominic was appointed Master of the Sacred Palace at Rome; this office has been ever since reserved for members of his order. He died at Bologna, Aug. 6, 1221, worn out by his con-

stant work and a life of the utmost asceticism, and was canonised 1234. His festival is kept on Aug. 4.

**Dominica.** British West Indian island and colony, in the Windward Islands, lying between Gua-



Dominica. Map of the British West Indian island discovered by Columbus in 1493

deloupe and Martinique, French Leeward Islands. In length 29 m. by 16 m. broad, with an area of 281 sq. m., the island, of volcanic origin, is very mountainous, rising in the Diablotin to 4,747 ft. There are many thermal springs, a celebrated boiling lake, sulphur deposits, and forests. The arable parts (about one-quarter) are fertile, producing limes, coconuts, oranges, bananas, spices, and cocoa.

The island's capital, Roseau (pop. 9,600) is the seat of an elective council. There is a native settlement with mixed negroes and 100 pure Caribs. The name commemorates the discovery by Columbus on Sunday (Lat. *dies Dominica*), Nov. 3, 1493. Pop. est. 54,505.

#### Dominical Letter.

Called Sunday Letter, and used in the construction of the calendar to mark the Sundays throughout the year. It must be one of the first seven letters of the alphabet.

Beginning with A for Jan. 1, the first 7 days of the year receive each the following letter up to G. If Jan. 1 falls on a Saturday the Sunday or Dominical letter for the year will be B. If Jan. 1 is a Monday, the Sunday letter will be G. See Calendar.

**Dominican Republic** or SANTO DOMINGO. Republic of the West Indies. It occupies two-thirds, the eastern part, of the island of Hispaniola, covers an area of 19,332 sq. m., and had a pop. in 1943 of 1,882,932. The final boundary settlement with Haiti was made in 1936. The capital is Ciudad Trujillo (114,308) on the S. coast. The leading commercial crops are sugar cane, cocoa, tobacco, maize, and molasses. Large forest areas yield cedar, mahogany, satinwood, and dye woods. Mineral resources have yet to be fully exploited, but gold, silver, platinum, copper, iron, rock salt, and petroleum occur. Railways run some 800 m., principally between Sanchez and Puerto Plata, the chief port; there are over 2,300 m. of motor roads.

The republic is governed under the constitution of 1942 by a president elected for 5 years and a two-chamber congress (senate, 19 members; chamber of deputies, 38 members), the executive being vested in the president, assisted by a cabinet of eight. The prevailing religion is Roman Catholic. Education is free and obligatory. A university was founded in 1538. The inhabitants are of mixed Spanish, African, and Indian races, but speak Spanish and are essentially Spanish in their mode of living, in contrast to their neighbours in Haiti. Racial problems induce many Haitians, in spite of severe penalties, to enter the Dominican republic, with consequent civil disturbances.

The negro republic of Haiti, set up in 1804, dominated the whole island until 1844, when the Dominican republic gained status as an independent country. While the U.S.A. was engaged in civil war, 1861-65, Spain resumed control over this lost colony. In 1916 the country was occupied by U.S. marines, who left in 1934. During the American occupation, order and security were established, new roads and rlys. were constructed, commercial production grew rapidly, population increased markedly. Early in the 20th century the U.S.A. undertook to collect the customs, giving 45 p.c. of the revenue to the government and retaining 55 p.c. for repayment of debts; the 45 p.c. thus brought into the local treasury was greater than the whole revenue of any preceding year.

The Dominican republic had the first stone-built church, San Nicolas, in all the Americas. The cathedral at Ciudad Trujillo contained originally in an ornate tomb



S. Dominic as portrayed by Fra Angelico in his picture of the Crucifixion in S. Mark's Church, Florence



the remains of Christopher Columbus. A shrine to the memory of the discoverer, to cost upwards of £1,000,000 contributed by all the American nations, is sited here. Ciudad Trujillo was largely destroyed by a hurricane, Sept. 3, 1930; and the island was damaged by a tidal wave, Aug. 5, 1946. *Consult* The Americans in Santo Domingo, M. M. Knight, 1928. *See* Haiti, map.

**Dominicans.** Common name for the religious order of friar preachers instituted at Toulouse in 1216 by S. Dominic. In accordance with the decree of the second Lateran council (1215), which forbade the institution of any new order in the Church, the founder adopted the existing rule of S. Augustine and thus obtained the formal sanction of Pope Honorius III and a bull confirming the foundation of the new order, Dec. 22, 1216.

The name of Black Friars was given to the Dominicans on account of the black cloak which they wear over a white tunic. S. Dominic was himself an Augustinian canon and his followers wore the habit of canons regular; subsequently they adopted a white tunic with hood and the scapular. The aim of the order was to teach truth, and *veritas* (truth) is its motto. The Dominican family is divided into three branches. The first is composed of men preachers, who shall deliver to others the fruits of study. The second consists of women, enclosed nuns, consecrated to a life of prayer and contemplation. The third branch—commonly called tertiary—was divided again into (1) those living in community, and (2) men and women living in the world who desire to adopt a rule of life and to share in the work of the order; S. Catherine of Siena (*q.v.*) is the most famous of them.

The organization is democratic in basis, each priory electing its superior, and the priories electing their provincial ruler. In 1217 S. Dominic began sending his followers abroad. Centres were established at Paris, Madrid, Rome, and Bologna. The first general chapter was held at Bologna in May, 1220. The preaching friars arrived in England in Aug., 1221, and settled in Holborn, London, and at the suppression of the monasteries there were 58 foundations in England.

Missionary zeal sent Dominicans beyond the confines of Europe. Through Armenia and Persia they pressed into Asia as far as India, where they made a centre at Goa, and arrived in China and Japan.

In the wake of Portuguese explorers they passed into Africa. This progress is typical of their activity in all domains; there seems no branch of human knowledge in which Dominicans have not left their mark. As well as S. Catherine of Siena, S. Thomas Aquinas, Fra Angelico, Fra Bartolommeo, Savonarola, Tauler, and Henry Suso were of the order.

In the popular mind the Dominicans are always associated with the Inquisition. On this tribunal members of the new orders, and particularly Dominicans, were generally chosen to sit. In all cases of heresy tried at Rome the presiding official must be a Dominican, while the master general and another member are ex-officio consultors.

In spite of this connexion it is noticeable that in the Middle Ages the order appears on more than one occasion as stepping forward to stand between those holding unpopular views and opinions, the Jews for example, and popular clamour, and the records of the order show its members as a whole distinguished for a singular clarity and breadth of view. The revival in France, associated with the name of Lacordaire, resulted in the re-erection in 1850 of the French province. *See* Black Friars; *consult* The Dominican Order and Convocations, E. Barker, 1913.

**Dominion** (Lat. *dominus*, a lord). Word meaning lordship or authority. It was the name given to the federation of the Canadian provinces carried out in 1867. The phrase "Great Britain and the Dominions" was used at the Imperial Conference of 1926—a secretaryship of state for Dominion Affairs had indeed been set up the previous year—and the position of self-governing dominions was laid down in the statute of Westminster, 1931. This referred to Canada, Australia, New Zealand, South Africa, the Irish Free State, and Newfoundland. The constitution of Newfoundland was suspended in 1933, and in 1949 it became a province of Canada. The Irish Free State in 1937, assuming the Irish name for the country, declared Eire to be a sovereign and independent state, though it remained associated with the British Commonwealth for certain purposes until 1949. Meanwhile, India (1947–50), Pakistan and Ceylon became the first dominions not originally colonised from Europe. *See* Westminster, Statute of.

**Dominion Day.** Public holiday in Canada on July 1 to celebrate the anniversary of the foundation

of the dominion, 1867. Dominion Day is kept in New Zealand on Sept. 26 as a public holiday to commemorate the country's elevation to dominion status in 1907.

**Dominions.** Former name of a British govt. dept. It was created by the Conservative government in July, 1925, when the Dominions office was set up to take over the Colonial office business relating to the self-governing dominions, also to the colony of Southern Rhodesia and various South African territories. The National government of 1931 and later administrations appointed separate ministers for the dominion and colonial offices. In 1948 the secretaryship of state and the office were both changed in name from Dominions to Commonwealth Relations.

**Dominions Royal Commission.** A body appointed in 1912 under the chairmanship of Lord D'Abernon to report upon the resources and development of the self-governing dominions of the British Empire. Six members represented the U.K. and one member each sat for Canada, Australia, New Zealand, South Africa, and Newfoundland. It held its first sitting in London, and 160 others in the capitals of every state or province of the dominions. The final report of the Commission was published in 1917.

**Dominis, MARCO ANTONIO DE** (1566–1624). An Italian theologian and scientist. A native of Dalmatia, and educated at Loretto and Padua, he was at first associated with the Jesuits, and for a time lectured on physics and mathematics. He became bishop of Segni and archbishop of Spalatro. In 1616 he joined the Anglican Church, and was appointed dean of Windsor by James I. Six years later he went to Rome and sought reconciliation with his former church; but he was imprisoned by the Inquisition, and died a few months later.

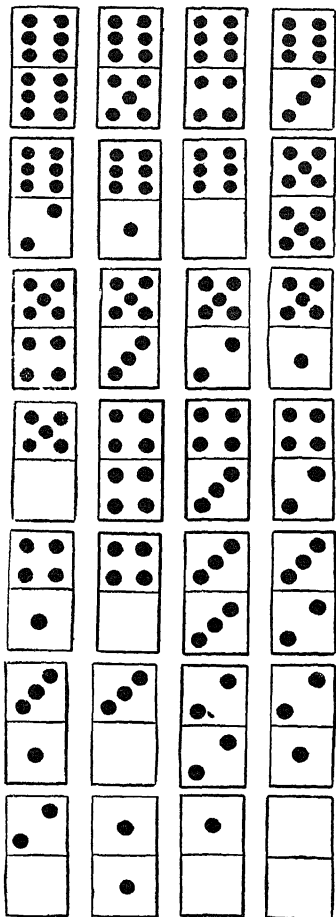
**Domino.** Mask, half-mask, or a cloak, worn by masqueraders as a disguise. The term is applied also to the wearer of the garment. A domino was also an ecclesiastical hooded cloak, black on one side, whence the name of the game of dominoes is supposed to have been derived. *See* Acting.

**Dominoes.** Game invented in Italy in the 18th century. It is played with 28 oblong pieces, termed cards or stones, marked with indented black spots, on an ivory face divided into two compartments, and having black backs generally made from ebony. The



pieces are numbered 6-6 (double-six), 6-5, 6-4, down to 6-0; the same with the 5, 4, 3, 2, and 1 respectively; and 0-0 (double-blank).

In the French or Draw Game the dominoes are shuffled face downwards on the table, and the right to play first is determined by each player drawing a piece, the drawer



Dominoes. Complete set or "pack" of dominoes; the lowest is known as the double-blank, the highest as the double-six

of the highest number having the lead, or, as it is called, the "down." The pieces are then re-shuffled and each player takes seven, the rest forming the stock which remains on the table unfaced. The leader plays a domino (it is invariably best to lead the highest), and the other follows by matching the number at one end of the card played, from his own hand or by drawing from the stock. This continues with each player alternately until the

dominoes, both in hand and in the stock, are exhausted; the one who is first out calling "Domino," and winning the game by the number of pips contained on the pieces (or cards) still in possession of his adversary. If it is impossible for either player to exhaust his pieces, the one left with the smaller number of pips wins.

Other varieties of domino games are the block game, domino-whist, domino-loo, threes and fives, Sevastopol, bingo, the passing game, and the matador game.

**Domitian** (A.D. 51-96). Roman emperor. His full name was Titus Flavius Domitianus Augustus. He was born Oct. 24, 51, the younger son of Vespasian, and succeeded his brother Titus in 81. Tacitus's gloomy picture of the reign of Domitian was probably biased. Modern research indicates that he took a genuine interest in provincial government, and that misrule in the provinces was practically unknown in his reign. Latterly, however, he appears to have become suspicious and tyrannical, and informers flourished. Among those persecuted by him were the Christians. A punitive expedition against the Chatti, a series of campaigns in Britain under Agricola, and a war with the Dacians which ended in a humiliating peace, were the military features of his reign. The declining influence of the senate was still further impaired under Domitian, and the emperor assumed a pomp and circumstance more characteristic of despotism than anything seen at the courts of his predecessors. He met his death at the hands of a freedman named Stephanus, instigated by the emperor's own wife Domitia, Sept. 18, 96.

**Dom Juan**; or, LE FESTIN DE PIERRE (Don Juan: or, the Feast of the Statue). Five-act comedy by Molière. Adapted from Spanish-Italian originals, the scene is laid in Sicily. Dom Juan's valet, Sganarelle, serves as the author's mouthpiece, and the part was acted by Molière himself. The comedy was first produced at the Palais-Royal, Paris, Feb. 15, 1665, but not printed until 1682.

**Domodossola**. Old frontier town of Italy, in the prov. of Novara. It is 19 m. by rly. N.W. of Pallanza on Lake Maggiore. It commands fine views of the Pennine Alps, especially of Monte Rosa, and is a convenient centre for tourists to the Alps. A monument here marks the spot where the airman Chavez met his death after making the first flight across the

Alps, Sept., 1910. Domodossola was the headquarters of an Italian resistance movement against Fascists and Nazis in the summer of 1944. Pop. 6,000.

**Domra**. Russian musical instrument similar to the balalaika (*q.v.*), but of oval shape.

**Domrémy-la-Pucelle**. Village of France, in the dept. of Vosges. It stands on the Meuse, 6 m. N.W. of Neufchâteau, and contains the house where Joan of Arc (*q.v.*) was born in 1411, and which became state property in 1818. Opposite the house is a monument with a bust of the heroic saint. On a hill in the neighbourhood, where she is supposed to have heard the voices which inspired her, a magnificent church has been built.

**Don** (Lat. *dominus*, lord). Title prefixed to the Christian name in Spain, formerly confined to men of rank, but now used like "Mr." The feminine is *doña*. In the United Kingdom fellows or tutors of a college in a university are called dons. In the form "dom" the title was prefixed in Portugal and Brazil to the Christian name by royal princes and, with royal authority, by private persons.

**Don**. River of the West Riding of Yorkshire, England. It rises in the Pennines near the Cheshire border and flows S.E. through Sheffield, thence N.E. past Rotherham and Doncaster to the Ouse, which it enters at Goole. It is linked up by canals with the Trent and the Calder. Its length is 70 m.

**Don**. River of Aberdeenshire, Scotland. It rises near the Banffshire boundary and flows for 78 m. in an E. direction to the North Sea, which it enters a little to the N. of Old Aberdeen. Its valley contains the richest alluvial farm land in the county, and has great granite quarries. The lower river drives paper and woollen mills.

**Don**. River in S. Russia. Rising from Lake Ivan in the region of Moscow, S. of Tula, it flows S.E. and S.W. through the regions of Voronezh and Stalingrad and the Azov-Black Sea area into the sea of Azov. The vineyards and wines of its neighbourhood are celebrated, and it provides excellent fishing. It is navigable, except in the winter, for half of its 1,160 m., and is one of the chief waterways for transporting cattle and grain from the interior. It is connected with the Volga by the Kalach-Stalingrad rly., and has numerous tributaries. It is the ancient Tanais.

In their campaign in Russia during the Second Great War,

German forces reached the Don at the end of Nov., 1941. After capturing Rostov, the invaders were driven out in a few days by Gen. Remizov's army. In 1942 there was fierce fighting at Voronezh in early July, and by July 10 German forces were firmly established on the E. bank. There was savage fighting in the Don bend as the Russians retired E. On July 24 the Germans crossed the river at Tsymlyanskaya, and Rostov was evacuated three days later.

Having relieved Stalingrad, Russian forces crossed the Don at three places between Kalach and Tsymlyanskaya on Dec. 5. Two armies crossed the frozen reaches of the middle Don, liberating hundreds of villages and routing the Italian expeditionary force. With the recapture of Voronezh in Jan., 1943, the E. bank of the Don was cleared of German forces, except in the Rostov area until that city was retaken on Feb. 14.

**Don, KAYE ERNEST** (b. 1891). A British racing motorist. Born April 10, 1891, he began to race cars in 1920, won the Ulster T.T. race in 1928, and made lap records at Brooklands, exceeding 136 m.p.h. in 1930. Taking up motor boat racing in 1931, in Miss England II he attained 103½ m.p.h. on the Parana river and 110 m.p.h. on Lake Garda. He failed, however, at Detroit in 1931 and 1932 to recover the British international trophy for this sport from the U.S.A.



Kaye Don, British racing motorist

**Donaghadee.** Watering-place of co. Down, N. Ireland. It stands on the North Channel, 22½ m. E. of Belfast by the Belfast and County Down rly. It has telegraphic and telephonic communication with Portpatrick, Scotland, from which it is distant 21½ m. Pop. 3,358.

**Donald, SIR ROBERT** (1861-1933). British journalist. Born in Banffshire, he gained journalistic experience in Edinburgh, Northampton, Paris, and New York. He founded the Municipal Year Book in 1893 and was editor of the Daily Chronicle, 1892-1918. In 1906 he took charge also of Lloyd's News, becoming managing director of United Newspapers, Ltd., in 1911. In the First Great War he was a director at the

ministry of Information. He was made G.B.E., 1924, and died Feb. 17, 1933.

**Donald Duck.** Character in cartoon films by Walt Disney. Appearing first in the black-and-white Orphans' Benefit, 1934, he was drawn in coloured films with The Band Concert, 1935, and in his unending predicaments became one of the outstanding creations of the cinema. See Disney, Walt.

**Donaldson, JAMES** (1751-1830). Scottish newspaper proprietor and philanthropist. Expanding the prosperous printing business in Edinburgh left him by his father, Donaldson left £240,000 to found a home for 300 poor children.

**Donarite** (Ger. *Donner*, thunder). German blasting explosive. The composition varies according to its place of manufacture, but its main feature is its high content of nitroglycerol, 22-33 p.c., with a small amount of nitroglycerine, both gelatinised with 1 p.c. nitrococton. It also contains 50-70 p.c. ammonium nitrate and sodium nitrate, one p.c. wood meal, and up to 12 p.c. di- and trinitrotoluol. Its manufacture involves the following operations: (a) preparation of the gelatine from the nitroglycerol and collodion cotton with the addition of D.N.T.; (b) preparation of the solid mixed components; (c) kneading the above to form a loose mass, which is then made into cartridges.

**Donat, (FREDE- RICK) ROBERT** (b. 1905). A British actor. Born in Manchester, March 18, 1905, he studied for the stage with James Bernard, making his first professional appearance in Julius Caesar at Birmingham, 1921. A member of Sir Frank Benson's company, 1924-28, he acted with the Liverpool repertory company, at the Cambridge festival theatre, and scored an outstanding success in London in Precious Bane, 1933. He played then in A Sleeping Clergyman and Mary Read. He joined the Old Vic company in 1939, and in 1943 took over management of the Westminster Theatre, where he played in The Cure for Love, 1945. Donat

entered films in 1932, and was starred in The Count of Monte Cristo; The Thirty-Nine Steps; The Ghost Goes West; Goodbye, Mr. Chips; The Young Mr. Pitt; The Winslow Boy. See Actor illus.

**Donatello,** in full Donato di Niccolò di Betto Bardi (1386-1466). Italian sculptor. Born at Florence, he appears to have left for Rome about 1401, possibly in the company of Brunelleschi, and to have returned again to Florence in 1406. Two years later he received the commission for the famous statue of S. George, in Or S. Michele (now in the Bargello), Florence, completed in 1415; he also executed a S. Peter and a S. Mark. He went to Padua in 1444, and there produced the noted equestrian statue of Gattamelata—the first horse to be cast in bronze.

Other important works were wrought at Ferrara, Venice, and Modena, and in 1457 the master returned to Florence, where he died Dec. 13, 1466. His bronze David, in the Bargello, and the beautiful Judith, in the Loggia dei Lanzi, proclaim him as the greatest sculptor of single figures since classical days. Consult Lives, H. Rea, 1900; 10th earl of Crawford, 1903.

**Donati, GIOVANNI BATTISTA** (1826-73). Italian astronomer. Born at Pisa, Dec. 16, 1826, he was admitted in 1852 as a student at the Florence observatory, and became director in 1864. He discovered six comets, that observed June 2, 1858, being named after him. He was one of the first to apply the spectro-scope to astronomical research. He died Sept. 20, 1873.

**Donatio mortis causâ.** Legal term meaning a gift of personal property in prospect of death, and to take effect on the donor's death. The gift must be completed by



Donatello, Italian sculptor From an old print



Donatello. His statue of S. George in the Bargello, Florence

delivery—mere words will not do. Thus "You can have my watch after my death" is not a valid gift unless the watch is actually handed to the donee. Such a gift is revoked if the donor recovers from his then illness, and the property reverts to him—e.g. the watch must be handed back. If the person making the gift dies and the property left by him is not sufficient to pay his debts, the gift may be taken for that purpose, as it is similar to a legacy. Estate and legacy duties are payable on gifts.

**Donation of Constantine** (*Donatio Constantini*). Forged document by which Constantine the Great conferred on Pope Sylvester and his successors imperial rights in, together with possession of, the city of Rome "and all provinces, places, and towns of Italy and the Western regions."

Under the title *Constitutum domini Constantini imperatoris* the document, which is addressed by the emperor to the pope, consists of two parts. In the first Constantine gives the history of his conversion to the Christian faith. In the second he enumerates the details of his grant to the pontiff in Rome, which he abandons for the new capital he has established for himself in the East. The authorship, date, and purpose of the forgery still await elucidation. One view is that its purpose was to further the territorial aspirations of the papacy, traces its origin to Rome, and dates it in the 8th century. The other, contending that its object was rather to justify the transfer of the imperial dignity (*imperium*) to the Franks, finds its origin in the Frankish empire, and dates it at the time of the coronation of Charlemagne (800), or in the following century. It was first clearly referred to by Pope Leo IX in 1054. It was shown to be a forgery in the 15th century. See Constantine.

**Donatists.** Followers of Donatus the Great, a sect formed by members of the N. African Church about the beginning of the 4th century. It seems to have originated gradually from the objection raised to the reconciliation of those Christians who had fallen away in times of persecution. But the immediate cause of the Donatist disruption was the consecration of a rival bishop of Carthage by Bishop Donatus about A.D. 311.

The ultimate result was the division of the African Church into two great parties, the Catholic and the Donatist. The latter consecrated opposition bishops, and in

some cases at least rebaptized orthodox clergy and laity who joined them. The Donatists claimed to be orthodox on all points and to be in complete doctrinal agreement with the Catholics, but to possess alone an uncorrupted priesthood. See Christianity.

**Donauwörth.** Town of Bavaria, Germany. It stands just where the Wörnitz joins the Danube, i.e. on the left bank, and is 25 m. N. of Augsburg. Among its churches are the Gothic parish church of the 15th century, and the one formerly belonging to the monastery of the Holy Cross. The abbey buildings are now used for a school, library, and other purposes. There are a Gothic town hall and the Tanzhaus. There is trade along the river, and manufactures of beer, etc. Donauwörth developed from a group of houses around the castle of Mangoldstein, and for three centuries after 1307 was a free city. The ruler of Bavaria entered it in 1607 in order to punish the inhabitants for interfering with a religious procession, and it remained, except for a few years, part of Bavaria. Marlborough's victory of the Schellenberg was gained here July 2 (N.S.), 1704. Pop. 5,000.

**Donbas.** Contracted name for the industrial region of Ukraine S.S.R. described as Donetz Basin.

**Don Benito.** Town of Spain, in the prov. of Badajoz. It stands on the left bank of the Guadiana, 27 m. by rly. E. of Merida. In a district rich in grain and fruit, it trades in oil, wheat, and wine, and manufactures soap, jute, brandy, flour, cloth, and linen. It dates from the 15th century, when it was founded by refugees from Don Llorente, which was subject to inundation. Pop. 21,059.

**Doncaster.** Co. and parl. bor. and mkt. town of the W. Riding of Yorkshire, England. It stands on

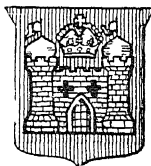
the Don, 156 m. N. of London and is served by two main line rlys. The chief church is S. George's, a cruciform structure with a lofty central tower; it was rebuilt after designs of Sir G. Scott in the 19th century. There are other churches, an old grammar school, mansion house, guildhall, and corn exchange. A charter was granted by Richard I in 1194.

Doncaster is an important rly. centre, with traffic from extensive coal mines in the neighbourhood. Here are the large railway workshops, while the industries are the making of agricultural machinery, electric goods, brass, wire rope, wallpaper, and artificial silk. The Don is navigable, and there is water communication with Sheffield, Goole, and Hull. Doncaster is governed by a mayor and council and has a service of buses and trolley-buses. The town returns one member to parliament. Doncaster is also famous for its race meetings, the St. Leger being run on a Wed. in Sept. on Town Moor. There are cattle and retail markets on Tues. and Sat. Pop. est. 71,030.

**Donegal.** Maritime county of Eire, part of Ulster. It has about 165 m. of rugged and deeply indented coast-line on the Atlantic ocean. Donegal Bay in the S., and Loughs Swilly and Foyle in the N., are the largest inlets, and the Foyle is the longest stream; Lough Derg, the only lake of any size is studded with many small islands. Aran, Tory, and several smaller islands lie around the coast. The surface is mountainous (Erigal, 2,466 ft.) and frequently boggy. Stock-rearing and fishing occupy the majority of the people.

Donegal tweed is woven in many places and linen manufactured at Raphoe. Eight deputies are returned to the Dáil. Lifford (county town), Letterkenny, Ballyshannon, Donegal, and Bundoran are the chief towns. Land area, 1,865 sq. m. Pop 136,035.

**Donegal.** Market town and seaport of co. Donegal, Eire. On Donegal Bay, at the mouth of the Eask,



Doncaster, Yorks. The south side of the parish church of S. George, built by Sir Gilbert Scott in 1858

46 m. S.W. of Londonderry by rly., it trades in agricultural produce. The Annals of the Four Masters (1636) were compiled in its Franciscan monastery, remains of which and a castle of the O'Donnells still exist. Near by is a chalybeate well. Market day, Sat. Pop. 9,674.

**Donegal Bay.** Large inlet of the Atlantic off the N.W. Irish coast. It penetrates inland some 35 m. between the counties of Donegal on the N. and E. and Sligo and Leitrim on the S. It is 30 m. across at its entrance between Malin More or Teelin Head and Lenadood Point. Several bold promontories project into the bay, the chief of which are Drumanoo

another Arthur. Arthur, the 3rd earl, was created a British peer as Baron Fisherwick in 1790 and given the Irish titles of earl of Belfast and marquess of Donegall in 1791. Edward, the 4th marquess, was dean of Raphoe for over 40 years. Edward Hamilton (b. 1903) succeeded his father as 6th marquess in 1904. Educated at Eton and Christ Church, Oxford, he became a journalist, contributed regularly as a columnist to The Sunday Dispatch, and was war correspondent to The Star.

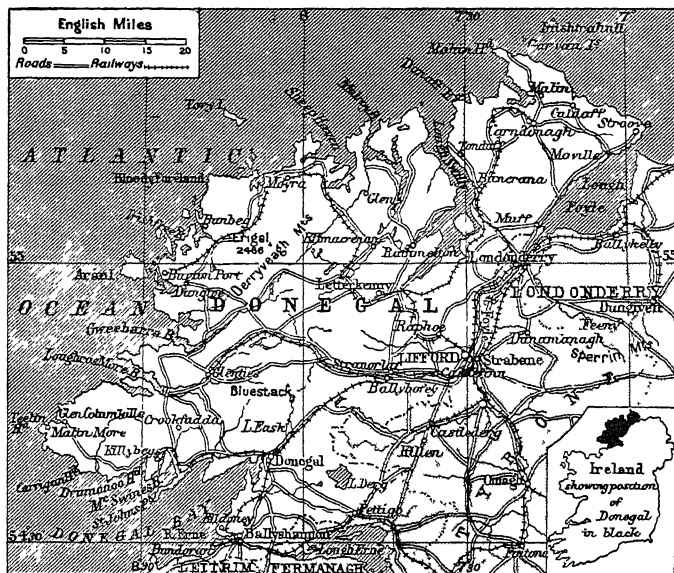
**Donetz.** River of Ukraine S.S.R. and the Azov-Black Sea area of R.S.F.S.R. The chief tributary of the Don, it rises near Kharkov and, flowing S. and S.E.,

from the Donetz field with iron ore from the mines of Krivoi Rog made possible the development of a large ferrous metallurgical industry in Ukraine. Bauxite and manganese also occur.

In the Second Great War the Germans were advancing in Oct., 1941, into the Donetz basin, and Kharkov and Stalino had fallen. Marshal Timoshenko assumed command of the southern half of the Russian front and checked the thrusts. The Germans pressed on towards Rostov, which they took, but in the last days of Nov. a counter-attack threw them back nearly to Stalino. In July, 1942, the invaders launched a double offensive, the S. arm in the Donetz area taking Vorooshilovgrad on July 19 and cutting the Moscow-Rostov rly. After bitter fighting in the Don bend the Germans established two bridgeheads on the S. bank of the lower Don.

In Dec. 1942 and Jan. 1943 Russian offensives on the Middle Don drove the German armies back to the Donetz. By the beginning of Feb., 1943, the Soviet armies were endangering the German hold on the Donetz basin. By March 9 the Russians had been forced back yet again to the N.E. bank of the Donetz, evacuating Kharkov March 15; but German attempts to cross the upper river were repelled. On Aug. 23 Kharkov was recaptured and a new Soviet offensive began in the Donetz basin. On Sept. 4 Soviet forces crossed the northern Donetz at several points; Stalino was liberated on the 8th; and the expulsion of German forces from the basin was completed.

**Don Giovanni.** Tragi-comic opera in two acts by Mozart with libretto by Da Ponte. An operatic masterpiece, this comedy of manners which conflicts with human issues represents Mozart at his most dramatic, *e.g.* the music of the statue, the arias of Donna Anna and Donna Elvira, the final quartet. The overture—one of the most elaborate composed by Mozart—was written the night before the first performance at Prague, Oct. 29, 1787. In the 19th century in England the flamboyant, essentially Italian character of the text was misunderstood. The opera was first given in England by amateurs at Hayward's Floorcloth Manufactory; an English version was produced at Covent Garden, May 30, 1817. Revivals at Glyndebourne in the 1930s, in the original Italian were noteworthy as was the Sadler's Wells version (E. J. Dent's translation).



Donegal, Eire. Map of the extreme north-western county of Ireland. Its mountains and bays provide some of the most picturesque scenery in Ulster

Head, St. John's Point, Kildoney Point, and Roskeeragh Point. It receives the waters of the rivers Erne, Eask, and smaller streams, and the towns of Donegal, Killybegs, Bundoran, and Kildoney stand on its shores. Anchorage is not considered safe, but refuge may be sought in the small inlets that open off the bay.

**Donegall, MARQUESS OF.** Irish title borne by the family of Chichester since 1791. In 1612 Sir Arthur Chichester, lord deputy of Ireland, was made a baron, and in 1625, the year after his death, his brother, Sir Edward, was made a baron and a viscount. In 1647, the family having acquired large estates in Ireland, his son Arthur was made earl of Donegall, and was succeeded in 1674 by his nephew,

falls into the Don near Shakhti. It is 675 m. long. It gives its name to a prov. of Ukraine.

**Donetz Basin or DONBAS.** Industrial region of Ukraine S.S.R. It covers some 10,000 sq. m. and includes Stalino and Rostov. In 1930 the Russian government decided to construct 14 new towns in this district, among them Gorkovka, with a view to making it the greatest coal-producing area in Europe. Huge power stations, agricultural machinery factories, and engineering works were erected at a cost of nearly 650 million roubles. The Donetz basin contains about 60 p.c. of the bituminous and anthracite coal reserves of the Soviet Union, and had an annual pre-war output exceeding 80 million tons. Combining coal

**Dongola.** Name of two towns on the Nile in the Northern province of the Anglo-Egyptian Sudan. New Dongola is situated on the left bank, above the third cataract, and 750 m. S. of Cairo. During the operations against the Mahdi in 1884-85 it formed the British base, but when the British forces were withdrawn the town fell into the hands of the Mahdi. It is now a flourishing town with fine buildings and a thriving trade.

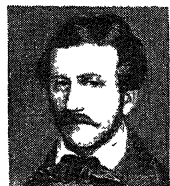
Old Dongola, on the right bank of the Nile, 75 m. S.S.E. of New Dongola, was the capital of the kingdom of Dongola, but was destroyed by the Mamelukes in 1820, and is now unimportant.

**Donington Hall.** County mansion in Leicestershire. It is near the village of Castle Donington, so named because there was once a castle here of which ruins remain beside the Trent, 9 m. N.E. of Ashby-de-la-Zouch. The hall, which stands in a fine park, was built in 1795, and was long the property of the earls of Huntingdon. When the 10th earl died in 1789 the hall passed to his sister Elizabeth, mother of the first marquess of Hastings. When Henry, the 4th marquess, died in 1868, it passed to his sister, the countess of Loudoun, and then to her son, the earl. During the First Great War the hall was used as a place of internment for German officers; it attracted much attention owing to visits paid to it by English persons of high station, and to the luxurious style of living permitted. In the Second Great War the neighbouring race track was taken over by the War office as a motor transport depot. See Castle Donington; Prisoner of War.

**Dönitz, KARL.** The name of this German Nazi leader is spelt Doenitz in this work.

**Donizetti, GAETANO** (1797-1848). Italian composer. Born at Bergamo, Nov. 29, 1797, the son of a

weaver, he became a soldier after he had studied music at Naples and Bologna. He was a teacher in Naples, lived after 1837 in Paris, and for a few years



Gaetano Donizetti, Italian composer

was master of the imperial chapel at Vienna. Composing over sixty operas, he exhibited a great natural gift for melody. The most popular are *Lucrezia Borgia* (1833), *Lucia di Lammermoor* (1835), *La Fille du*

Régiment (1840), and *Linda di Chamounix* (1842), and two early ones, *Zoraide di Granata* (1822), and *Anna Bolena* (1830). The earliest won for him a public triumph in Rome and exemption from military service. Donizetti also wrote masses, string quartets, and songs. He died April 8, 1848.

**Donjon** (late Lat. *domnio*, a dungeon). Principal tower of a castle, which served as the living place of the owner and his family, and as a refuge for the garrison in case of siege. See Castle; Keep.

**Don Juan.** Central figure of a long popular Spanish story, traditionally said to have had a basis of fact. Don Juan, according to the legend, in the 14th century killed a nobleman with whose daughter he had eloped. He was finally trapped by some friars in their monastery and murdered. The story has been utilised in drama many times, notably by Tirso de Molina (Gabriel Tellez), c. 1630, who was apparently the first to give Don Juan the surname Tenorio; Molière, 1665; and Zorrilla y Moral, 1844. It was satirised by Bernard Shaw in *Man and Superman*, 1905. In opera Don Juan has been treated by Mozart (Don Giovanni, *q.v.*, 1787) and other composers.

**Don Juan.** Serio-comic epic poem by Byron (*q.v.*). His name is all that the hero has in common with the famous figure of Spanish romance. Upon his amatory adventures and wanderings over a great part of Europe his creator lavished wit, humour, satire, and pathos, as well as his unique descriptive power and very mundane philosophy of life. Written in the Spenserian stanza, the sixteen cantos were published anonymously in six instalments, 1819-24.

**Donkey.** Alternative name for the domestic ass. See Ass.

**Donkey Engine.** Auxiliary stationary engine used for pumping, generating electricity, operating winches, or other work aboard ship not connected with actual propulsion. See Engine.

**Don-nai** OR **DONHAI.** River of Cochin-China, S.E. Asia. It rises in the highlands of Annam, at an alt. of 5,000 ft., and follows a generally S.W. course, effecting a junction with the Sebong and other streams to form a delta discharging into the China Sea. Two arms of the delta are navigable. The town of Saigon stands on its banks. Length, 250 m.

**Donnay, CHARLES MAURICE** (1859-1945). French dramatist. A Parisian, he began his career as playwright with *Phryné*, 1891,

following this the next year with *Lysistrata*, an adaptation from Aristophanes. His other plays include *Le Retour de Jérusalem*, 1903; *La Patronne*, 1908; *Le Ménage de Molière*, 1912; *Les Éclaireuses*, 1913; *La Chasse à L'Homme*, 1917. A commander of the legion of honour, and a member of the French academy since 1907, he died April 1, 1945.

**Donne, JOHN** (1573-1631). An English poet, courtier, and divine. Born in London, of Roman Catholic



John Donne, English poet  
Contemporary portrait

parentage, he was educated at Oxford and Cambridge. He entered Lincoln's Inn in 1592, joined the Anglican communion, accompanied Essex to Cadiz in 1596, and to the Azores in 1597. He travelled in Italy, Spain, Germany, and the Low Countries, and became private secretary to the lord keeper Egerton, whose niece he married clandestinely in 1601. In 1615 Donne was ordained and became in succession curate at Paddington, royal chaplain, vicar of Keyston, Hunts, rector of Sevenoaks, reader in divinity at Lincoln's Inn, dean of St. Paul's, 1621, and vicar of St. Dunstan-in-the-West. He died March 31, 1631, and was buried in St. Paul's cathedral.

As a poet Donne still suffers from his alleged occasional crudities; while his metaphysical arguments and conceits are obscure to many readers. But the originality, force, and passion of some of his lyrics, the glowing and sensuous records of what were evidently personal experiences, the sceptical and subtle thought, place him among the foremost love poets. The *Eccstasy* and *The Sun Rising* show Donne perhaps at his best. The brilliant, bitter *Satires*, 1593-97, are among the earliest English rhymed couplets. After about 1608 he turned to spiritual poems and intellectual exercises in theological verse; the superb sonnet, *Death*, be not proud, and *A Hymn to God the Father*, may be mentioned from this period.

The last of the great Elizabethan preachers, Donne in his sermons was lucid and attentive to patristic precedent. His theology was liberal and reasoned. His prose works include the *Pseudo-Martyr*, 1610, a reply to Bellarmine's defence of the Popish recusants; and a posthumously

published apology for conditional suicide, *Biathanatos*, 1648. With few exceptions his verses circulated only in MSS. during his lifetime; his sermons he carefully prepared for the press. *Pron.* Dun.

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**Donnelly, IGNATIUS** (1831-1901). American author and politician. Born at Philadelphia, he was called to the bar and removed in 1857 to Minnesota, where he took a prominent part in politics. During 1863-69 he sat in Congress as a Republican. He is principally remembered for his book, *The Great Cryptogram*, 1887, wherein he sought to prove that Bacon was the author of Shakespeare's plays. He also wrote *Atlantis*, 1882, to show that there once existed in the Atlantic, opposite the Straits of Gibraltar, an island which was the Atlantis of the ancients. Donnelly died Jan. 1, 1901. See *Bacon-Shakespeare Controversy*; *Cryptography*.

**Donnybrook.** Southern suburb of the city of Dublin, Eire, formerly a country village. In 1204 King John granted a licence for an annual fair to be held here, and this became, especially in the 18th and 19th centuries, the most disorderly of all Irish fairs. It was abolished in 1855.

**Dono, PAOLO DI.** Alternative name for the Florentine painter described as Uccello, Paolo (q.v.).

**Donoghue, STEPHEN** (1884-1945). British jockey. Born at Warrington, Oct. 15, 1884, Steve

Donoghue was apprenticed to the trainer John Porter at Kingsclere, later proceeding to Ireland. His career in England dated from 1910, his first big success being the winning of the



Steve Donoghue,  
British jockey  
Bassano

Cambridgeshire that year. From 1911 Donoghue was the most popular British jockey. In 1920 he rode 143 winners, and for years headed the list of successful jockeys. His chief title to fame was his score of six Derby winners—in substitute races in 1915 (Pommern) and 1917 (Gay Cru-

sader), and four at Epsom: Humorist 1921, Captain Cuttle 1922, Papyrus 1923, Manna 1925. He was the first rider to achieve three successive Derby wins. Donoghue won the Oaks in his last season, 1937. He died March 23, 1945. His son Pat Donoghue also became a jockey.

**Don Quixote.** Spanish novel by Miguel de Cervantes (q.v.). The first part was published in 1605, the second in 1615, having been preceded by a spurious second part by Avellaneda a year earlier. The story was designed as "from beginning to end an attack upon the books of chivalry."

Romances of chivalry had attained an extraordinary vogue, despite clerical fulminations and legal interdict. Cervantes' wonderful story of Don Quixote, the knight whose head was turned by the reading of romances of chivalry, and of his squire Sancho Panza, "did instantly what sermons and legislation had failed to do" (Fitzmaurice-Kelly). The story, said to contain 669 characters, is one of the world's greatest works of fiction.

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**Doonars.** Submontane tract in the extreme N. of India. It is in Jalpaiguri district, Rajshahi division, Bengal, near the frontiers with Nepal, Sikkim, and Bhutan. The area is about 3,500 sq. m., largely under tea where cultivation is possible, though there are also

paddy fields and jute and tobacco crops. The land at the foot of the Himalayas is mostly jungle forest, inhabited by wild beasts and receiving heavy monsoon rains. Pop. about 136,000.

**Doodle.** Colloquial term, of U.S. origin, for a scribbled drawing or decoration of the kind made by many people as a sub-conscious aid to concentration, e.g. on telephone pad or agenda paper. The U.S. term to doodle originally



Don Quixote and Sancho Panza alight at an inn which the knight imagines to be a castle, mistaking a country girl for a beautiful lady of high degree

From a painting by E. Gamba in S. Kensington Museum

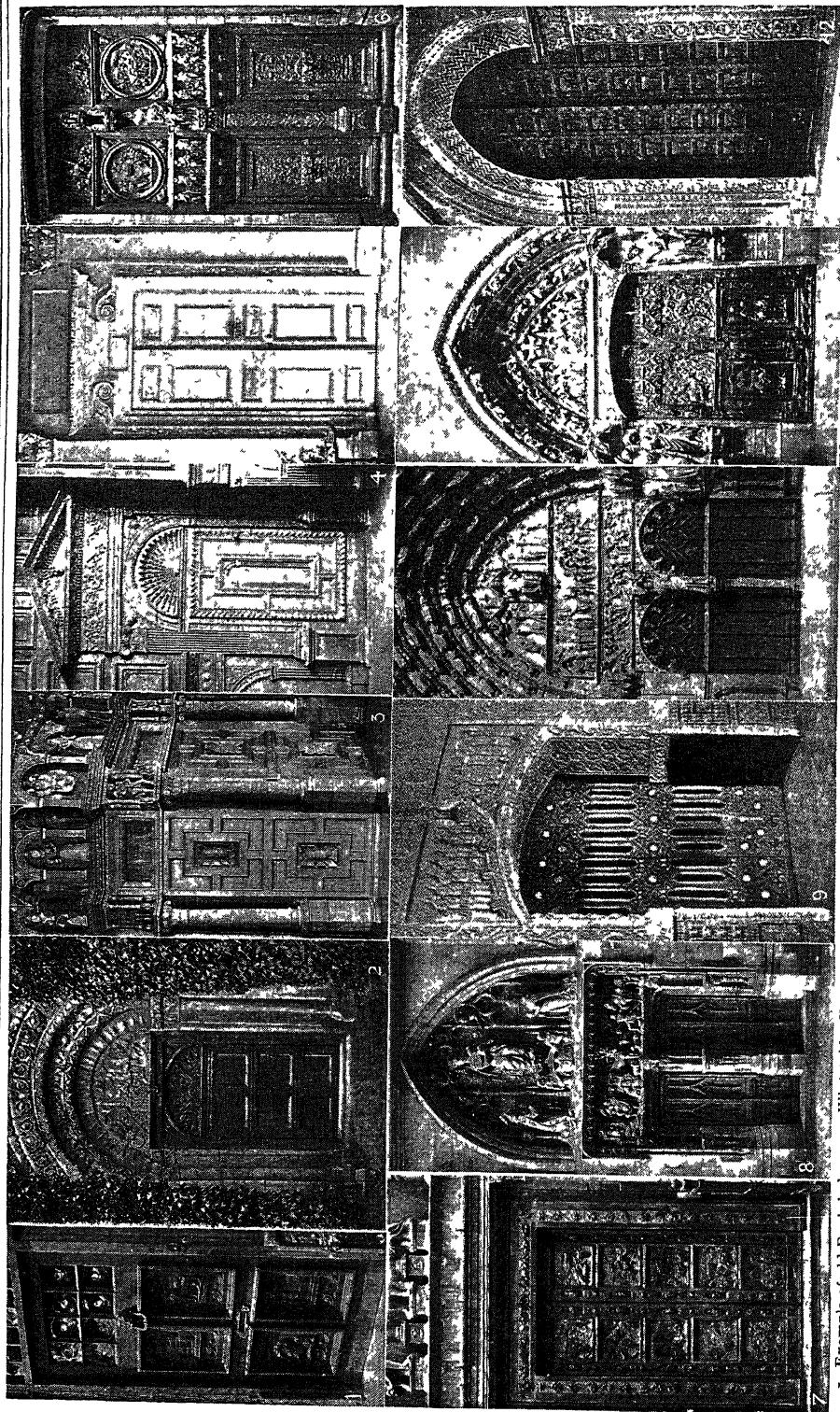
meant to trifle, but the more special significance was popularised on both sides of the Atlantic by an incident in Frank Capra's film *Mr. Deeds Goes to Town*, 1936.

**Doodlebug.** Popular name in the U.S.A. for the ant-lion (q.v.). As such the word is familiar to readers of Mark Twain's *Adventures of Tom Sawyer*. In the summer of 1944 it took on a new significance, being used first by U.S. troops in England, then by English people, as a popular name for the German V1 weapon, the Flying Bomb (q.v.). The sound of the missile as it travelled through the air had some resemblance to that of a buzzing insect.

**Dooley, MR.** Irish-American character invented by the humorist Finley Peter Dunne (q.v.).

**Doolittle, JAMES** (b. 1896). U.S. army air force officer. Born Dec. 14, 1896, at Alameda, Calif., he served as a flying instructor





1. Example of old English doorway, Whitstable, Kent.  
 2. Norman door, of the little church of Patricksbourne, near Canterbury, Kent.  
 3. Angle door, decorated Tudor style, Bradfield House, Devon.  
 4. Carved drawing-room door, Red Lodge, Bristol, c. 1590.  
 5. Library doorway, Thorpe Hall, near Peterborough.  
 6. Portal of S. Macdoug, Rouen, c. 1560.  
 7. Porta del Paradiso, Baptistery, Florence, c. 1450.  
 8. Door of chapel, Château d'Amboise, late 15th century.  
 9. Entrance door of Oratory, House of Pilate, Seville, 16th century.  
 10. Central door of Burgos Cathedral, 16th century.  
 11. Puerto del Sarmantal, Burgos Cathedral, 16th century.  
 12. Cathedral door, Monreale, Sicily, 1186

**DOOR: NOTABLE EXAMPLES IN ECCLESIASTICAL AND DOMESTIC ARCHITECTURE**

*Nos. 3, 4, and 5 by courtesy of Country Life*



during the First Great War. He later became internationally famous as an air pilot, winning the Schneider Trophy for the U.S.A. in 1925 at 235.57 m.p.h. In 1940 Doolittle returned to active service and in 1942 was promoted lieutenant-colonel. He led the spectacular daylight raid over Tokyo, April 18, 1942, and was appointed commander N.W. Africa air forces the following Feb. Commander of the U.S.A. 8th air force from Dec., 1943, he directed the daylight bombing of Germany. With this force Doolittle arrived in July, 1945, on the Pacific island of Okinawa to operate against the Japanese. His retirement from command was announced in 1946.

**Doom** (A.S. *dóm*, judgement). Originally a sentence on a criminal. It was applied specially to the judgements to be passed at the last day, and thus comes the common phrase day of doom or doomsday. It is used to translate the Greek word *themis*, in both cases the dooms being rather arbitrary judgements of the gods than legal sentences in which a certain reason, order, or custom plays a part. From the cognate word *deem* comes the Manx *deemster*. See Law.

**Doom.** Old English name for the Last Judgement, and for pictorial representations of the same. Dooms were a common feature of cathedrals and parish churches in pre-Reformation days, after which the reaction against everything that suggested idolatry led to the total destruction of all but a very few specimens.

Dooms were often executed in tempera, and were less frequently painted on panels. Indeed, there are records of only seven or eight such paintings in England. One was found during renovation work in Wenham Church, Suffolk, in 1892. A large whitewashed partition which reached to the roof was taken down in pieces and placed in the churchyard. Heavy rain revealed some figures, and careful cleaning disclosed a noteworthy example of a Doom bearing the marks where a crocheted rood cross and a figure of the Virgin and S. John on either side had been fixed. The Doom itself shows beneath the seated figure of the Divine Judge the familiar scenes of the weighing of the souls by S. Michael, with the Devil looking on, Hell Mouth, and the naked souls of the saved awaiting entrance at the gate of Heaven.

Another interesting panel painting of the Doom is in the triforium of Gloucester cathedral.

Instances of the rood cross being affixed to the Doom are extremely rare. Usually the cross stood on a screen beneath the Doom. Consult Wenhamston and Bulcamp, J. B. Clare, 1906.

**Doom Palm** or **DOUM PALM** (*Hyphaene thebaica*). Tree of the family Palmae. A native of Egypt and Nubia, it has the stem forked several times in old specimens. The fan-shaped leaves are produced in clusters, and from the centre of these arise the spikes of flowers, all males on one tree, and all females on another. The fruits, like large quinces, are in clusters of 100 to 200. Beneath a smooth, polished skin there is a thick layer of fibrous material surrounding the large solitary seed, and this substance, which tastes much like gingerbread, is eaten by the natives. The hard wood is made into domestic utensils.

**Doon.** River and loch of Ayrshire, Scotland. The river issues from the loch into Glen Ness, a deep and narrow ravine, 230 ft. deep, and flows N.W. for 36 m. through picturesque country, to the Firth of Clyde below Ayr. It is mentioned in Burns's famous ballad, *Ye Banks and Braes*. The loch contains five small islands, on one of which (Castle Island) is a ruin, called Balliol's Castle.

**Doon de Mayence.** One of the heroes of the *gestes* or French romances. He gives his name to the third cycle of Charlemagne legends. See *Chansons de Geste*.

**Doones, THE.** Outlaws who, in the 17th century, inhabited the Badgworthy Valley, Exmoor, on the borders of Somerset and Devon, England. They lived by cattle lifting and blackmail. An outrage at Exford, in which a child was killed and its mother carried off, led to the extermination of the band by moormen and troops. The Doones and the legends surrounding their name provided material for *Lorna Doone* (*q.v.*), a romance of Exmoor, by R. D. Blackmore.

**Door.** Flat, frequently solid rectangular structure of wood or metal for closing an opening. From antiquity the favourite material

has been wood; the doors of the Temple of Artemis at Ephesus, the Parthenon, and Propylaea are said to have been made of wood, and the doors of Solomon's temple were constructed of olive wood. On the other hand, it is probable that bronze and other metals were used in Babylonia and Egypt, and bronze doors were frequently made in the Middle Ages.

The oldest form of door is the single one suspended on a pair of hinges, but those of the Greeks and Romans were often double doors in two leaves. The ornamentation of doors began, also, at an early period. Those of the Greeks and Romans were often covered with carving in ivory and precious metals. Early Christian sculpture was employed on the



Doom Palm. Tree found in the oases of Egypt and Nubia

decoration of doors. On a fragment of a door dating from A.D. 386, in the ancient basilica of S. Ambrosio at Milan, were represented the Passion and Crucifixion of Christ. Doors in the Middle Ages were skilfully fitted with knockers and locks, but only a few examples remain. Norman doors were, generally speaking, plain, except for a little iron scroll-work on the exterior. They were constructed with a view to guarding against assault, and with this object were placed in a recessed doorway commanded by openings through which arrows could be discharged, or surmounted by projecting stonework which provided a means of aggression from above. There are doorways of this type at Rochester Castle and elsewhere. Iron scroll-work was developed and extended during the Early English period, sometimes covering the whole surface. In the Decorated style panelled doors and scroll-work of floral design occur, and in the Perpendicular period there was further development in panelling accompanied by the disappearance of iron scrollwork.

The Renaissance brought a vast enhancement in the decoration of doors. Sometimes they were decorated with elaborate panels showing figures in relief or intricate tracery. The finest art of Lorenzo Ghiberti and Andrea Pisano was

lashed on the sculptured bronze doors of the Baptistery at Florence. Jacobean architects bestowed their attention rather on the doorways; the doors themselves, decorously panelled, merely setting off most elaborate surroundings in the form of rich columns or pilasters and surmounting friezes and cornices. In common with other details of internal decoration, that of Jacobean doorways suffered a little from over-richness until Inigo Jones and John Webb introduced a severer treatment.

Towards the end of the 17th century the panelling of doors had become greatly simplified. Doors of this period rarely contained more than two panels apiece, sometimes crossed by three horizontal panels at the base, centre, and summit, as in a door at Thorpe Hall, Northants. The 18th century saw another type of treatment. Instead of two large upright panels to a door, there were now frequently six or eight. The moulding of these panels was not too obtrusive, and the component parts of the doorway design—architrave, frieze, and cornice—though often boldly carved and handsome, were more discreet in character than their Jacobean prototypes. The influence of Wren following that of Jones kept the design massive and scholarly. But the tendency in this was ever towards a more delicate type of classic treatment, and when the brothers Adam established their peculiarly refined standard of internal decoration doors were treated according to this prevailing fashion. A beautiful example of the Adam door, with eight panels in a doorway with a classic frieze and cornice, is at Sheen House, Richmond.

**Doorman**, KAREL WILLEM FREDERIK MARIE (1889-1942). Dutch naval officer. Born at Utrecht, April 23, 1889, he was commissioned in 1910. Qualifying as a pilot in 1915, he was appointed to command the Netherlands fleet air arm in 1936, and in 1940 was promoted rear-admiral and c.-in.-c. at Sourabaya. Following the Japanese attack on the East Indies he became c.-in.-c. of the Allied squadron at Sourabaya and commanded at the battles of Bali Straits (*q.v.*) and Java Sea (*q.v.*). He was lost with his ship the *De Ruyter* in the latter action, Feb. 27, 1942.

**Dope**. Slang term for lacquers made by dissolving cellulose compounds in certain solvents, and used in various manufactures.

These solutions yield tough, elastic, and transparent films on evaporation, and the property of yielding such films is the main reason why this class of dopes is employed in aeroplane construction. Dopes may contain 2½-10 p.c. of nitro-cellulose, according to the uses to which the lacquers are to be put. They are applied by dipping, brushing, or spraying. Dopes are used for production of artificial leather, stiffening toe-caps of boots, waterproofing leather, and backing furs to prevent the hair becoming detached. Straw hats and linen collars are treated with dope to render them waterproof and washable, and in the cinematograph industry the nitro-cellulose dopes are used for protecting the film from friction.

The term is also applied to petrol, especially when administered in some special manner to facilitate starting the engine; to preparations employed as admixtures with motor fuel to improve or alter its qualities. Dope has also become extensively used to mean narcotic drugs, such as cocaine and opium, taken by victims of the drug habit; and to the administration of drugs to racing animals. The illegal sale of drugs is known as the dope traffic.

**Doppler Effect**. In optics, the alteration in refrangibility of light due to the relative motion of the observer and the source of light. Pointed out in 1842 by Doppler of Prague, the idea is analogous to that of the alteration in pitch of a locomotive's whistle as the locomotive approaches or recedes: the sound waves arriving in quicker or slower succession respectively. Similarly, the light waves are pressed into a smaller space as the star approaches and therefore become shorter, and the ray they form is more refrangible. If the distance between us and the star is increasing, the waves lengthen, the ray becomes less refrangible. Fizeau showed later that the spectroscopic method detects these differences. The Doppler effect can also be observed with radio waves. See Astronomy; Optics.

**Dorado**. Name for the Swordfish, one of the southern constellations named by Bayer. It is situated between Pictor and Hydrus. The S. pole of the ecliptic is near one of the stars of this group.

**Doran**, JOHN (1807-1878). British author. Born March 11, 1807, he became tutor to several young noblemen and later took the degree of doctor of philosophy at Marburg, and settled down as

miscellaneous writer. His chief works are *Monarchs Retired from Business*, 1857, and *Their Majesties' Servants*, annals of the English stage from Betterton to Kean, 1864. He died Jan. 25, 1878.

**Dorando** (b. 1887). Italian long-distance runner, whose full name was Dorando Pietri. The most notable event of his career was his performance in the marathon race at the Olympic Games held in England in 1908. The course was from Windsor Castle to the stadium at Shepherd's Bush, a distance of 26 m. 385 yds., and the race was run by the pick of the world's long-distance runners. Dorando entered the stadium first, but collapsed on the track. He was assisted past the winning post when J. J. Hayes, U.S.A., was a bare 100 yds. behind.

Immediately after the finish a protest was lodged, Dorando was disqualified, and the race awarded to Hayes. As consolation Queen Alexandra presented Dorando with a gold cup. His time for the course was 2 hrs. 54 mins. 46½ secs., J. J. Hayes covering it in 18 secs. longer. Dorando later ran several marathon races in the U.S.A. on indoor tracks, beating Hayes on the first and third occasions, and losing to Longboat on the second. All three were beaten in a fourth race by a Frenchman, St. Ives.

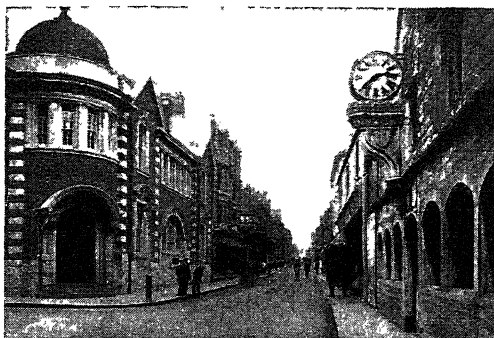
**Dorcas Society**. Name formerly much in vogue for societies of ladies who made garments for the poor, but seldom used now. The charitable woman at Joppa, referred to in Acts 9, was named Dorcas, hence the use of the word in this connexion.

**Dorchester**. Mun. bor., co. and market town of Dorset, England. It stands on the Frome, 135 m.



Dorchester arms

W.S.W. of London, on two railway lines. The four walks or boulevards occupying the line of the old Roman wall are an attractive feature. Notable buildings are the town hall, market house, county gaol, county hospital, grammar school, and museum, which contains local fossils and British and Roman antiquities. There is a bronze statue, erected in 1889, to William Barnes, the Dorset poet. Dorchester has an agricultural trade, is noted for its ale, and is associated with Judge Jeffreys, who held here the Bloody Assize in 1685. In the town are extensive military



Dorchester, Dorset. View of South Street; on the right is Napier's Mite, an almshouse built in 1616 by Sir Robert Napier; on the left, the post office

barracks. The Durnovaria of the Romans, Dorchester has many indications of early occupation, among which are the remains of an amphitheatre at Maumbury Rings, and Maiden Castle, to the S.W., a large British earthwork, the most perfect examples of their kind in England. Dorchester is the Casterbridge of Hardy's novels. Market days, Wed. and Sat. Pop. 12,000.

**Dorchester.** Parish and village of Oxfordshire, England. It stands on the Thame, near its confluence with the Thames, 9 m. S.S.E. of Oxford. It dates from Roman times. The see of a bishop from 886 to 1050, it has a suffragan bishop under Oxford. It has a fine old abbey church with a famous Jesse window.

**Dorchester, GUY CARLETON, 1st BARON (1724-1808).** British administrator. Of Irish parentage, he was born Sept. 3, 1724. He entered the army and saw service in Canada; in 1766 he was made lieutenant-governor of Quebec, and in 1775 governor. He defended the land during the war of American Independence until 1778, when he returned to England. In 1782-83 he was commander-in-chief in America; during 1786-96, again governor of Quebec, the Act dividing Canada into two provinces being passed during his governorship. He died Nov. 10, 1808. In 1786 he had been made a baron, and the title is held by his descendants, Dudley Massey Pigott Carleton (b. 1876) having succeeded in 1925.

**Dorchester House.** Former mansion in Park Lane, London. Occupying the site of an earlier house belonging to the earls of Dorset, this magnificent mansion in the Italian Renaissance style was built by Vulliamy, 1851-53. The property of Sir George Holford, it contained a superb

bearing the same name was erected on the site.

**Dordogne.** River of France. It rises on the Pic de Sancy, a mountain in the dept. of Puy-de-Dôme, and at Bec d'Ambès joins the Garonne, the two forming the estuary of the Gironde. It is about 300 m. long, and at its mouth is over 2 m. wide. It flows westward through the depts. of Corrèze, Lot, Dordogne, and Gironde, and is navigable for over 100 m. Its chief tributaries are the Cère, Vézère, and Isle.

**Dordogne.** Department of S.W. France. A hilly inland area of 3,550 sq. m., it is largely covered with forests of pine, oak, and chestnut, or barren heath; in the valleys the soil is fertile. Many cattle and pigs are reared, while the vine, wheat, maize, and tobacco are grown. Some minerals are found. The chief rivers are the Dordogne, Vézère, Dronne, and Isle. The capital is Périgueux. Other places are Bergerac and Brantôme. Dordogne was formed mainly from the old prov. of Périgord in Guienne. It is divided into five arrondissements. In this dept. have been found remains of very early man. Pop. 387,643.

**Dordrecht OR DORT.** Town of the Netherlands, in the prov. of S. Holland. It stands on an



Dorchester House. Former London mansion which stood in Park Lane

collection of pictures. It was rented from the owner by White-law Reid while American ambassador at the court of St. James's (1905-13), and during the First Great War was used as a hospital. In 1928 the earl of Morley, who had inherited it, sold Dorchester House to a syndicate; and in 1930 an hotel

island in the Maas, and is cut by the Merwede and other streams and canals, 12 m. S.E. of Rotterdam. The chief building is the Great Church, a Gothic structure dating from the 14th century. It has a lofty tower, which is a landmark, and its carved choir stalls are perhaps the most notable of its interior features. There is an old town hall restored in the 19th century, and the town has several museums, including one of antiquities housed in one of the gates of the city; there is also a museum containing memorials of the South African War of 1899-1902.

Dordrecht is a river port and a rly. junction. The river and canals afford communication with the sea and with other Dutch ports. A steam ferry connects with places on the other side of



Dordrecht. The Groothoofd Gate, rebuilt in 1618, now containing a museum

the Merwede. There are two parks. The industries are in the main connected with the transport trade, but there are engineering works, as well as sawmills, ship-building yards, sugar refineries, and other industrial undertakings. The town is typically Dutch in appearance, with its many waterways, bridges, and windmills, and quaint old streets and houses. Pop. 62,007.

Dordrecht came into existence about 1000, and its history is closely linked with that of the rise of the Dutch republic. In the Middle Ages it was one of the wealthiest cities of Holland. In 1618-19 the synod of Dort (*q.v.*) met here. German parachutists dropped here in May, 1940, during the German invasion of the Netherlands.

**Doré.** Lake of Canada, in the prov. of Saskatchewan. It has a length of 25 m. and a breadth of 14 m. It is bounded on the E. by the Birch hills, and is the source of the Doré river.

**Doré.** Group of mts. in France in the dept. of Puy-de-Dôme. Included in the Auvergne chain, the loftiest peak is Pic (or Puy) de Sancy, alt. 6,190 ft. Hereabouts are the sources of the rivers Dor and Dogne. The watering-place called Mont Doré is picturesquely placed among these mountains at an alt. of 3,400 ft., and is famous for its hot mineral springs. Pop. 2,100.

**Doré, LOUIS CHRISTOPHE GUSTAVE PAUL** (1833-83). French artist. The son of German parents named Dorer, he was born at Strasbourg, Jan. 6, 1833. In 1848 he was taken by his father to Paris, where he was employed as an illustrator by the *Journal pour Rire*. His Paolo et Francesca,

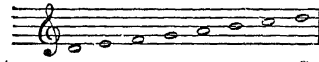


*Doré*

1863, first brought him into notice and stimulated his ambition to become a great historical painter; the huge religious compositions popularised through the Doré Gallery in London were the outcome. The scale of these betrayed him into serious faults of composition and drawing and his real genius is to be found in his designs for the masterpieces of Dante, Milton, Shakespeare, Balzac, and La Fontaine. Doré was also a sculptor of no mean merit, and at the time of his death in Paris, Jan. 23 1883, was engaged on a monument to the elder Dumas. Consult Gustave Doré, M. Rose, 1945.

**Doria, ANDREA** (1466-1560) Genoese soldier of fortune. His active career began in the military service of various Italian princes, but he made his reputation as a fighting seaman, first as commander of the galleys of the Genoese republic, and later as a commander under Francis I and under Charles V, transferring his support from one side to another as the interests of his native Genoa dictated. Charles V rewarded him with the order of the Golden Fleece and the title of Prince of Meli. A constant occupation of his energies was war fare with the Turkish corsairs who ravaged the Mediterranean. Doria refused the sovereignty of Genoa offered him, but ruled it well on republican lines. He died at Genoa, Nov. 25, 1560.

**Dorian Mode** (*Mus.*). Old church mode beginning on D and using only the "natural" notes, the white keys of the pianoforte. The scale was



with A as its dominant. See Dominant; Mode.

**Dorians.** One of the three great branches into which the ancient Greek race was divided, the other branches being the Aeolians and Ionians. Traditionally the Dorians came from the small district of Doris in N Greece, lying between Mt. Parnassus and Mt. Oeta, and overran virtually the whole of the Peloponnese somewhere about 1000 B.C. The occasion of this irruption into the Peloponnese was the effort, eventually crowned with success, to restore the Heraclidae or descendants of Hercules to the dominion they had lost in the Peloponnese. (See Heraclidae.)

Archaeological evidence confirms this tradition of a Dorian invasion of the Peloponnese, but the exact identity of the Dorians is still in doubt. In historical times the Dorians inhabited, in addition to the bulk of the Peloponnese, Megara, Aegina, Crete, Melos, and other islands of the Aegean sea, the S.W. coast of Asia Minor, and many colonies in Sicily, such as Syracuse and Selinus. Generally, though not invariably, the inhabitants of these parts spoke the distinctive broad Doric dialect. Sparta was regarded as the pre-eminent Dorian state.

**Doric Order.** The first of the three orders of Greek architecture. It is distinguished so far as its proportions are concerned by a certain robustness or masculinity. The Doric capital (*q.v.*) was generally carved out of a single block,

and the drums of which the column was composed were bonded together by wooden dowels. The Parthenon (*q.v.*) is the best example of the Grecian Doric. See Composite Order; Corinthian Order; Greek Architecture; Ionic Order; also *illus.* pp. 569, 656.

**Doris.** Genus of naked-gilled, marine molluscs, commonly known as sea-lemons or sea-slugs. Twenty-two species of these occur round the British coasts, notably the common Doris, about an inch in length. In appearance it somewhat resembles a small half-lemon, with a pair of ridged tentacles and a circle of leaf-like gills standing out from the body.

**Doris.** Small district of ancient Greece, lying between Mt. Parnassus and Mt. Oeta, the traditional home of the Dorians (*q.v.*).

**Dorislaus, ISAAC** (1595-1649). Anglo-Dutch lawyer and diplomatist. He was born at Alkmaar, N Holland, and educated at Leiden, and about 1627 came to England, where he held for a time a history lectureship at Cambridge. In 1640 and 1642 he was judge advocate, and in 1648 was appointed a judge of the admiralty court. He took a leading part in drafting and carrying through the charge of high treason against Charles I, and was assassinated by royalists whilst on his second diplomatic mission to The Hague, May 12, 1649. He was buried in Westminster Abbey.

**Dorking.** Residential and market town of Surrey, England. Standing on the Mole, immediately below the North Downs, it is 25 m. S.W. of London, by electric rly., also served by buses and coaches of London Transport. Dorking urban district includes Westcott, N. Holmwood, Brockham, Mickleham, and Westhumble; the



Gustave Doré. Christ leaving the Praetorium, one of the most famous of the French master's series of pictures illustrating the life of Christ

National Trust property of Box Hill, and the Norbury estate preserved by Surrey county council.



Dorking. The High Street of this Surrey market town, with the White Horse inn on the right

oil. The sandstone ridge S. of the town affording views across the Weald is almost entirely public space. In the vicinity are Leith and Holmbury Hills. The town has some light industry, but its character is being preserved by planning. S. Martin's church is a beautiful landmark. Market day, Mon. Pop. est. 17,320.

The district is rich in literary and historical associations. The Pilgrims' Way passes through. Fanny Burney lived at Westhumble and met Gen. d'Arblay at Juniper Hill. Nelson is reputed to have stayed at the present Burford Bridge hotel on the eve of Trafalgar; Stevenson stayed there on occasion. Meredith lived at Flint Cottage. Dorking is well known to readers of Pickwick. Disraeli wrote *Coningsby* at Deepdene mansion. At this house, H.Q. of the Southern rly., were planned the transport arrangements for D-day, 1944. E. M. Forster resided near, and Ralph Vaughan Williams in, Dorking. The battle of Dorking was an imaginary combat described in a book (1871) by Sir George Chesney, who pictured the Germans making a victorious invasion.

#### Dorking Fowl.

Breed of fowl deriving its name from the town where it was at one time extensively bred and fattened. It is one of the few surviving old English breeds that have outlived modern introductions, still holding its own as a table bird, especially when crossed with the old English or Indian game. A peculiar characteristic of the Dorking breed is that



Dorking Fowl. Cock of this old English breed of fowl

it possesses a fifth toe—an additional toe on each foot.

There are five varieties: dark, silver grey, white (with rose-comb), red, and cuckoo, though the last three are virtually extinct. The Dorking is not adapted for close confinement, but is ideal for the farm.

#### Dorling,

HENRY TAPRELL. British naval authority and writer (under the pseudonym Taffrail).

Trained in H.M.S. Britannia, 1897, he served with distinction in the Royal Navy, retiring in 1929 but being recalled in the Second Great War. During 1939-42 he was at the ministry of Information, and was then public relations officer to the c.-in.-c., Mediterranean. As Taffrail, he wrote novels and adventure stories of the sea, of which the best known were probably *Pirates*, 1929; and *The Man from Scapa Flow*, 1933. He was an authority on service medals and decorations.

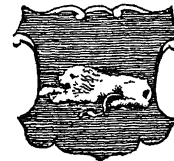
**Dormancy.** Condition in which the life processes of an organism or its parts proceed with such low intensity as not to be obvious. In animal life this condition is also known as hibernation (*q.v.*). Seeds are subject to dormancy imposed on them by surroundings which contain an excess of carbon dioxide or do not offer adequate moisture, oxygen, or heat supply. Some are spontaneously dormant while internal changes are rendering them fit for germination, or changes are proceeding in the seed coats to render these permeable to moisture and oxygen. Whole plants may lie dormant while climatic conditions are unsuitable to growth.

#### Dorman-Smith,

SIR REGINALD HUGH (b. 1899). British administrator. Educated at Harrow and the R.M.C., Sandhurst, he joined the Indian Army and served in the 3rd Afghan War, 1919. Elected Conservative M.P. for Petersfield, 1935, he was president of the National Farmers Union, 1936-37, minister of Agriculture and Fisheries, 1939,

and became governor of Burma in Dec., 1940. After the Japanese invasion of that country he went to India. When in Oct., 1945, civil administration was restored to Burma his term as governor was extended, but he resigned owing to ill health in Aug., 1946.

#### Dormant.



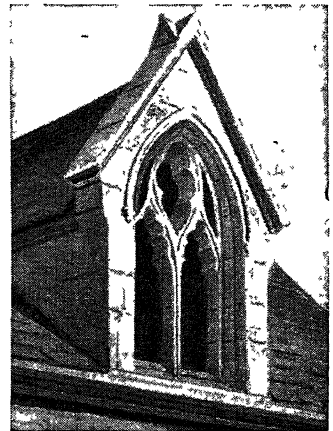
Dormant in heraldry

In heraldry, a sleeping animal, lying down with its head between its front paws. If the head is erect the beast is described as

couchant. See Heraldry.

#### Dormer (Lat. *dormire*, to sleep).

In architecture the name given to a window set in the inclined roof of a house. Storm window, porch window, and cripple window are local names for the dormer. Parker's Glossary speaks of the



Dormer window in old chapel, Cleve, Somerset

existence of these windows about the middle of the 14th century, but their real value as architectural features was not discovered much before the 17th century. In Jacobean buildings they contribute to the balance and symmetry of a façade, and in combination with the hipped roof they are a conspicuous and valuable feature of Georgian architecture.

**Dormouse.** Small Old World rodent about 3 ins. long, exclusive of the tail, which is about the same length. It has a very compact body and a large head with conspicuous ears and eyes so prominent that they seem almost to stand out from the head. The fur is tawny on the back and yellowish beneath, with a white patch on the chest. Only one species, *Muscardinus avellanarius*, found all

over Europe, is native to Great Britain. It is usually found in small plantations and hedgerows, where it constructs a nest. It feeds only at night and spends the day asleep in its nest. In autumn it builds a special nest for the winter, and stores it with a supply of nuts and corn. Here it sleeps through the cold weather, only waking up on mild days to feed. It usually hibernates from Oct. to April.



Dormouse. *Muscardinus avellanarius*, only U.K. species

**Dornier.** Firm of German aircraft manufacturers, founded by Dr. Claude Dornier (b. 1884). Most Dornier designs of the Second Great War were bombers of the medium or heavy class, but the firm also constructed various kinds of reconnaissance flying boats. The Do-X (see Aeroplane illus.) of 1929 was the largest aeroplane built to that date. The Dornier 217 (see illus. p. 132) was one of the standard bombers of the Luftwaffe. It was a high-wing monoplane usually fitted with two 1,600 h.p. B.M.W. radial engines. The wing span was 62 ft. 5 ins., and the fuselage (length 56 ft. 6 ins.) accommodated in the nose a crew of four and a heavy armament. Up to 5,550 lb. of bombs were carried further aft. The long slender lines of the earlier Dornier 17 suggested the nickname "flying pencil."

**Dornoch.** Royal, police, parli. burgh, and co. town of Sutherlandshire, Scotland. It stands near the entrance to Dornoch Firth, 58 miles by railway N.N.E. of Inverness, is a favourite summer resort, and has good bathing and golfing. The original cathedral (1222-45), of which only the tower survives, was restored in 1837, and became the parish church; it contains the tombs of the Sutherland family. Dornoch has remains of the former bishop's palace, destroyed in 1570. Near is Skibo Castle. Pop. 2,670.

**Dornoch Firth.** Inlet of the North Sea. It penetrates inland 22 m. between the co. of Sutherland on the N. and Ross and Cromarty on the S. At its entrance between Brora and Tarbat Ness, the distance is 11 m. The firth is a noted fishing ground, large quantities of cod and haddock being caught.

Dornoch and Bonar Bridge are the principal towns on its shores. Navigation is rendered difficult owing to bars and sandbanks. The shores are hilly and forested, except at Tarbat Ness, where they are sandy and low.

**Dorogobush.** Town of Russia, in the Western region of R.S.F.S.R. It is 55 m. E. of Smolensk, on the Dnieper, served by branch rly. It has trade in grain, flax, hemp, wax, skins, leather, wool, and glass. It was an old fortress, the earth ramparts of which are still standing, and has been occupied by Lithuanians and Poles. In the Second Great War the Russians evacuated Dorogobush after the fall of Smolensk on Aug. 14, 1941; they retook it Feb. 23, 1942; had to retreat in July; but finally stormed the town Aug. 30, 1943.

**Doronicum.** Flowering plant of the family Compositae, better known as leopard's bane (q.v.).

**Dorothy** (Gr. *dōron*, gift; *Theou*, of God). Feminine Christian name. It is a variant form of the less popular Dorothea, and its masculine equivalent is Theodore.

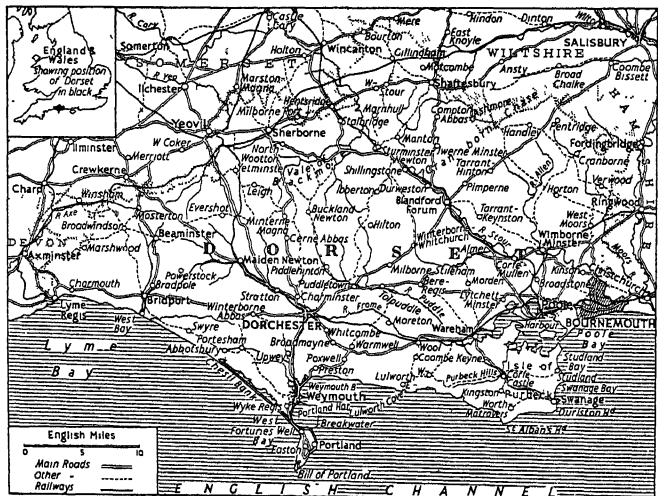
**Dorothy.** Comic opera written by B. C. Stephenson, and composed by Alfred Cellier. A comparative failure when first produced at the Gaiety, Sept. 25, 1886, it was transferred to the Prince of Wales's Theatre, and then to the Lyric, where it had a run of 931 continuous performances. At the Prince of Wales's the title-rôle was played by Marie Tempest, and Geoffrey Wilder by Ben Davies. At the Gaiety, Hayden Coffin created the part of Harry Sherwood, and Arthur Williams that of Lurcher.

**Dorpat.** German name of the town of Estonia S.S.R. called in Estonian Tartu (q.v.).

**Dorset** or **DORSETSHIRE.** Southern maritime county of England. It has about 75 m. of bold and picturesque coast on the English Channel, of which the chief features are Chesil Bank, a shingle beach extending nearly 16 m. from West Bay to Portland Bill, St. Alban's Head (440 ft. high), and Poole Harbour. Chalk downs traverse the central and S. parts of the county, on which are pastured the celebrated Dorset horned sheep. The Frome (flowing to Poole Harbour), Stour, and Puddle are the longest streams. Dairy farming is important, the quality of Dorset butter being widely appreciated. Portland and Purbeck stones are largely quarried for building purposes. The cliffs and shore of Lyme Bay are of perpetual fascination to the geologist and here Mary Anning (q.v.) discovered remains of an ichthyosaurus. Fishing is engaged in, but little attention is given to manufactures. At Abbotsbury is a famous swannery. Dorchester is the county town; Poole and Weymouth, the largest, are the chief ports; Swanage and Lyme Regis holiday resorts; Wareham, Sherborne, and Shaftesbury of historic interest. In the N. is the Vale of Blackmore, with its genial climate and famous pastures. Many interesting antiquities include the ruins



Dorset arms



Dorset. Map of one of the principal dairying counties of the south of England. Dorset also produces the Portland and Purbeck stone



of Corfe Castle. Three M.P.s are elected, and one by Poole. Area, 973 sq. m. Pop. 239,352.

**LITERARY ASSOCIATIONS.** The county is particularly rich in these from the time of Aelfric the Grammarian, who was abbot of Cerne towards the close of the 10th century. John Hutchinson, historian of the county, was rector of Wareham; Thomas Spratt, poet and bishop of Rochester, was born at Beaminster; Edward Stillingfleet was born at Cranborne; George Crabbe was rector of Evershot; William Barnes, the dialect poet, was born at Rushay. Sir Thomas Wyatt was buried at Sherborne, Matthew Prior is believed to have been born at Wimborne, and Weymouth was the birthplace of Peacock. T. E. Lawrence was fatally injured in a road accident near Moreton.

Writers who have found inspiration in Dorset scenery and character include Fielding, who inherited the manor of E. Stour and took the vicar of W. Stour as model for Parson Adams in *Joseph Andrews*; Jane Austen, who set scenes of *Persuasion* in Lyme Regis; Wordsworth, who wrote much of *The Excursion* while staying at Race-down Lodge, near Pilsdon. M. E. Francis (Mrs. Blundell) wrote novels and short stories of Dorset life. The chief modern literary associations centre in the novels of Thomas Hardy, who was born at Higher Bockhampton; the Wessex of his books is centred upon the county of Dorset.

**Dorset, EARL, MARQUESS, AND DUKE OF.** English titles borne successively by the families of Beaufort, Grey, and Sackville. John Beaufort, earl of Somerset (d. 1410), the eldest son of John of Gaunt, was created marquess of Dorset in 1397. The title, however, was taken from him later, though in 1411 his brother, Thomas, was made earl of Dorset, being succeeded by his son Edmund in 1441, who was made a marquess, and later became duke of Somerset. His son Henry was beheaded in 1464, and the title became extinct. Thomas Grey (1451-1501), 8th Earl Ferrars and stepson of Edward IV, was created marquess of Dorset in 1475. His grandson, Henry (1510-54), was made earl of Suffolk and, being implicated in Wyatt's rising, was beheaded in 1554, and the title once more became extinct.

Thomas Sackville was created earl of Dorset in 1604. His grandson, Charles, the 6th earl, was the father of Lionel (1688-1761), the

7th earl, who was created duke in 1720. The duke was twice lord-lieutenant of Ireland. With the death of the 5th duke in 1843 the title became extinct. *See* Sackville.

**Dorset, THOMAS SACKVILLE, 1ST EARL OF (1536-1608).** English statesman and poet. Born at Buck-



Thomas Sackville,  
1st Earl of Dorset

hurst, Sussex, son of Sir Richard Sackville, chancellor of the exchequer, he was educated at Oxford and Cambridge, and called to the bar as a member of the Inner Temple. With Thomas Norton he collaborated in *Gorboduc* (also called *Ferrex and Porrex*), the first English tragedy in blank verse, acted 1561; and for vol. ii (1563) of *The Mirror for Magistrates* wrote the Induction and the Complaint of the Duke of Buckingham.

Sackville, whose work influenced Spenser, was Grand Master of Freemasons, 1561-67; and M.P. for Westmorland, 1558; East Grinstead, 1559; and Aylesbury, 1563. Raised to the peerage as Baron Buckhurst in 1567, he was made a P.C. and lord lieutenant of Sussex, 1569; was sent on political missions to France, 1568 and 1571; was commissioner at the trial of the fourth duke of Norfolk, 1572; and announced to Mary Queen of Scots the sentence of death, being thanked by her for the manner in which he discharged the duty. Ambassador to the Low Countries in 1587, he incurred the displeasure of Elizabeth, but received the Garter, 1591. Appointed lord treasurer, 1599, and created earl of Dorset, 1604, he died at the council table in Whitehall, April 19, 1608. His works were edited by R. W. Sackville-West, 1859.

**Dorset, CHARLES SACKVILLE, 6TH EARL OF (1638-1706).** English courtier and wit. He was born Jan. 24, 1638, son of the 5th earl, whom he succeeded in 1677. Two years previously he had been created 4th earl of Middlesex, having succeeded to the title and estates of his maternal uncle, the 3rd earl. After some travel abroad, he returned to England at the Restoration and became M.P. for East Grinstead. He was a favourite of Charles II, but left the court on that king's death. In the Second Dutch War of 1665 he was a volunteer, and his famous lyric, "To all you

ladies now at land," is said to have been written on the eve of the battle of Harwich, June 3. He supported the invitation to William of Orange to become king in 1688, and was made privy councillor, lord chamberlain, K.G., and a lord justice of the realm during William III's absence from England. Though a dissolute prodigal, Dorset was a generous patron of Dryden, Wycherley, and Prior. He died Jan. 29, 1706.

**Dorsetshire Regiment.** British regiment. Originally the 39th Foot, raised in 1702 and later amalgamated with the 54th Foot. The regiment first saw active service in India and earned its first battle honour at Plassey in 1757. For its part in the defence of Gibraltar in 1779-83 it earned the castle and key which now forms part of the badge; and in token of its distinction at Fort Marabout in 1801 was awarded the sphinx on the badge. The Dorsets also took



Dorsetshire Regiment badge

part in the Peninsular, Burmese, Mahratta, and Crimean Wars, and were at Ladysmith in the South African War. Thirteen battalions were raised for service in the First Great War, in which battle honours include Mons, Marne, Ypres 1915-17, Somme 1916-18, Hindenburg Line, Suva, and Shaiba. During the Second Great War, battalions of the Dorsets served in India and France; one battalion landed in Normandy on June 6, 1944 (D-day) and fought through the campaign in N.W. Europe to Berlin. The regiment's motto is *Primus in Indis*, a tribute to its early service in India. The depot is at Dorchester.

**Dorset Square.** London square. Built early in the 19th century, it is situated close to Marylebone railway terminus. It was named after the duke of Dorset, belongs to the Portman estate, and stands on the site of the original Lord's cricket ground.

**Dort, SYNOD OF.** Assembly of the Dutch Reformed Church, which met at Dordrecht in 1618-19 to discuss the chief points of controversy between the Calvinists and the Arminians. The meeting was largely brought about by political partisans, who saw a chance of forwarding their purposes by accentuating the bitterness of theological controversy. It was



notable as marking the turning point when Calvinism began to decline. The five points under discussion were election, the universality of redemption, free will, the operation of divine grace, and the perseverance of the faithful. The synod was largely occupied with disputes as to procedure, but finally adopted a large number of canons condemning Arminian teaching. See Arminianism.

**Dortmund.** Formerly one of the main industrial cities of Germany. The centre of the rich Ruhr coal area 50 m. E.N.E. of Düsseldorf, it was prosperous in the Middle Ages, later much reduced, and then had a rapid rise after 1900. Situated between two main rly. lines from Berlin to the West, linked with the North Sea by the Dortmund-Ems canal, and a junction of air lines, Dortmund was the ideal centre for most of Germany's heavy industries: mining, iron and steel, heavy engineering. Large breweries were widely famous. About 7,000 vessels arrived and departed every year from the canal port, with a turnover of nearly four million tons of goods. The pop. in 1939 was 537,000, tenth highest in Germany.

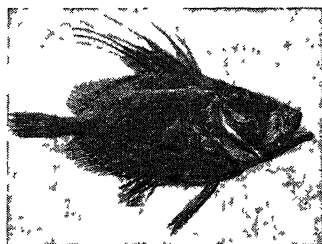
The narrowly built historic part of the city, surrounded by pleasant parks on the site of former walls, held the Reinoldi church of the 13th century, an outstanding building until heavily bombed in 1944; S. Mary's (12th century; slightly damaged); S. Peter's (14th century; unroofed); a 13th century town hall with many treasures (virtually destroyed); and the guild house (15th century). The Latin Tremonia, Dortmund was first mentioned in 899, became a seat of the emperors, and was distinguished by a special freedom of tax and duties. It was a centre of the Fehmgericht (*q.v.*). It joined the Hanseatic League, waged war on clerical rulers and, though impoverished during the Thirty Years' War, preserved its privileges and rank as a free city until 1803. Then it fell to the prince of Nassau-Orange, was incorporated into the grand duchy of Berg created by Napoleon, and in 1815 with Prussia. During 1923-24 it was occupied by French troops. In the Second Great War, the target of devastating Allied air raids, it was virtually destroyed.

**Dortmund-Ems Canal.** One of the most important canals in Germany. The small river Ems, which flows into the North Sea near

Emden, was canalised to a short distance above Lingen, and a canal was made to Dortmund, in the Ruhr coalfield. Barge navigation began in 1899 over the total length of some 150 m. The canal provides an outlet for the coal and metallic products of Westphalia, and is an alternative route to that provided by the Rhine.

The canal was frequently bombed by the R.A.F. during the Second Great War, the embankments being breached more than once during 1944-45. The canal was re-opened by British engineers in 1946.

**Dory** or **JOHN DORY.** Marine fish, *Zeus faber*, of the Zeidae family, common in the Mediterranean, the



Dory. Fish of the Zeidae family

English Channel, and St. George's Channel, and valued for the table. It is greatly compressed laterally, has a very large head, and is of repulsive appearance. Its yellowish colour, with metallic reflections, seems to justify the explanation of its name as a corruption of the French *jaune dorée*, yellow gilded.

**Dose.** In medicine, the quantity of a medicament ordered to be taken. The British Pharmacopoeia specifies minimum and maximum doses, but these are not final. The study of the quantities in which drugs should be administered is called posology.

**Doseh** (Arab. treading). Ceremony formerly observed in Cairo in connexion with the festival of the Mûlid en-Nebi, the birthday of the Prophet. It took place on the 12th day of the 3rd month of the Mahomedan year in the quarter of the city known as the Abbâsiyeh. Fifty or more of the Sa'diyeh dervishes lay close together on the ground and their sheikh on horseback rode over them. The horse trod upon each prostrate form twice, first with fore feet and then with hind feet. Meanwhile the spectators kept up the cry of "Allâh-lâ-lâ-lâ-lâh-lâh!" If a dervish was injured he did his best to conceal the injury. Those uninjured were regarded as specially

favoured by God. Deaths and injuries having attended the ceremony, it was suppressed by the khedive Tewfik in 1884.

**Dossi, GIOVANNI** (c. 1479-1542). Italian painter. Born in or near Ferrara, he and his younger brother Battista (d. 1548) studied under Lorenzo Costa at Bologna. Giovanni came under the influence of Titian and Giorgione and developed a completely romantic style of his own. The Madonna with Saints, originally in the church of S. Andrea at Ferrara, later removed to the museum of that town, is accounted Dossi's masterpiece; other fine paintings, some of which Battista painted in part, are preserved at Ferrara and Modena.

**Doss-megen-ora.** Group of mts. W. of Urumchi, Sinkiang, Central Asia, connected with the Tienshan range. It is over 19,700 ft. high, and the name means Loftiest of Mountains.

**Dost Mahomed Khan** (1793-1863). Ruler of Afghanistan. His brother, the vizier Futteh Khan, had raised Mahmoud Shah to the throne, but Mahmoud punished the vizier for a robbery committed by Dost. The vizier's eyes were put out, and later he was assassinated.



Dost Mahomed Khan, ruler of Afghanistan

Thereupon Dost led a revolt, as a result of which the kingdom was divided among Dost and his brothers, Mahmoud retaining only Herat. Dost's portion included Kabul, and here he ruled with great ability. He defeated the Sikhs and sought an alliance with England, but when the governor-general of India urged him to give up the attempt to recover Peshawar, he sought relations with Russia. War was declared against him in 1838 by the British, who marched to Kandahar and set up another ameer, Shah Shua. Dost fled to the mountains, was pursued, and in Nov., 1840, surrendered to the British. Two years later he was released, returned to Kabul and consolidated his throne. In 1855 Dost changed his policy of hostility and concluded an alliance with the British. He behaved with perfect loyalty all through the Indian Mutiny, and cooperated with the British in the war against Persia, 1862. He died suddenly, June 9, 1863, after capturing Herat.

**Dostoevsky, FEODOR MIKHAILOVITCH** (1822-81). Russian novelist. Son of a military surgeon, he was born at Moscow, Nov. 11, 1822, and left the St. Petersburg school of military engineering to enter the army. After a few years he resigned to devote himself to literature, and in 1846 published his first novel, known in England as *Poor Folk*. His political interests led him to associate with a group of political dreamers who surrounded Petrashevsky, and with them he was arrested in 1849. Exiled to Siberia, 1850-54, he spent three further years in the army after his return, and turned again to writing, embittered, suspicious, and morbid. In a succession of novels, *The Family Friend*, 1859; *The House of the Dead*, 1861; *The Insulted and the Injured*, 1862, he gave expression to his hatred of bourgeois society and his sympathy with the debased Russian working classes. Despite his success as a novelist in Russia and France, he remained poor, and ventures in newspaper editing only increased his difficulties. In 1867 he fled to Germany to escape his creditors, and lived chiefly at Baden-Baden, where he indulged his passion for gambling. Four years of feverish writing sufficiently restored his finances to enable him to return to Russia. His last years were prosperous, and he died at the height of his fame, Jan. 28, 1881.



Feodor Dostoevsky,  
Russian novelist

Dostoevsky inaugurated a new school of writing. Himself little influenced by other writers, he left an indelible impression on Russian literature. His genius came to fruition in *Letters from the Underworld*, 1864. In his earlier work it is possible to detect the influence of Balzac and George Sand and even the sentimentality of Dickens, but after his Siberian experiences his writing underwent a profound change. His vivid characterisation and deep insight into the psychology of emotion distinguishes the great series of works beginning with *Crime and Punishment*, 1866; continued with *The Gambler*, 1867; *The Idiot*, 1868-69; *The Possessed*, 1871; and ending with *The Brothers Karamazov*, 1880. In these he attempted to justify the ways of God to man, and in the first and

last of them achieves a power of expression which some critics think has never been equalled by any other novelist.

**Bibliography.** Dostoevsky's *Letters to His Wife*, trans. E. Hill and D. Mudie, 1930; Dostoevsky, E. H. Carr, 1931; Dostoevsky, G. Abraham, 1936; *The Breath of Corruption*, I. Roe, 1946; Dostoevsky, J. C. Powys, 1946.

**Dotheboys Hall.** In Dickens's novel Nicholas Nickleby, a private boarding school in Yorkshire. It was controlled by an ignorant bully, named Wackford Squeers, and his wife. Teaching was reduced to a farce and the pupils were starved. The description was no exaggeration. Some hints of this are found in *The Times* of June 29, 1838, the year in which the novel was published, in the form of two advertisements almost identical with that given in the novel. One of the schools advertised was near Kirkby Stephen, Westmorland, and the other near Richmond, Yorks. At both the fee was £20 per year for board, clothes, books, and instruction: there were "no extras and no vacations," and one of the masters "attended daily at the Saracen's Head," as Squeers is represented to have done. The original of Dotheboys Hall is understood to have been at Bowes, near Barnard Castle, by a personal inspection of which, in Jan., 1838, Dickens obtained his facts. The publication of Nicholas Nickleby hastened the end of such places.



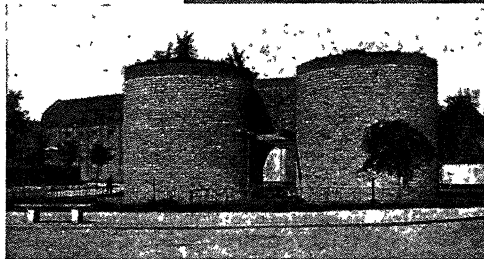
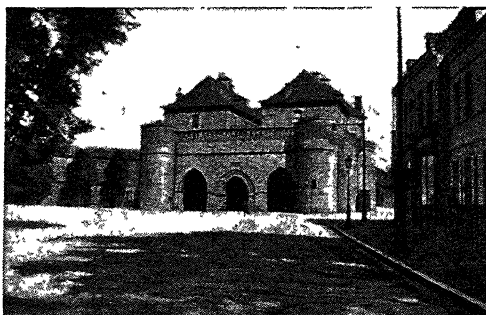
Dotterel. A species of plover which breeds in Scotland

**Dotterel** (*Eudromias morinellus*). British bird of the plover family. It still breeds in Scotland, but is becoming rare in England. It is about nine inches long and is brown in colour with black and white markings. It is found on mountain sides and visits

ploughed fields in search of grubs and insects.

**Douai** or **DOUAY.** Town of France, in the dept. of Nord. It is on the Scarpe, 18 m. S. of Lille. The hôtel de ville is a fine Gothic building. In the palace of justice the parliament of Flanders met. A museum houses a valuable collection of books, paintings, etc. The chief churches are S. Pierre, with its 16th century tower, and Notre Dame, dating from the 12th century, with altarpiece by Jean Bellegambe. There are a 15th century gateway, the old hall of the parliament of Flanders, and some old houses, but most of the buildings are modern. Douai has colleges and schools of all kinds, including a state college of agriculture. Its industries are mainly ironworking and engineering, the making of glass, chemicals, etc. There is a trade along the river and canals. Pop. 37,258.

Douai has been in existence since the time of the Gauls. Fortified in



Douai. Remains of the old fortifications. Upper picture, the Valenciennes gate, dating from the 15th century; lower picture, the Arras gate

the Middle Ages, it passed from Flanders to Burgundy, and then to Spain, but became French in 1713. During 1562-1793 there was a Roman Catholic university: the town is chiefly known for its English college

(1568–1903), where priests were trained to work for the conversion of England. The Old Testament of the Douai Bible was issued from here in 1610. In the First Great War Douai, with Lille, passed early into the hands of the Germans, who retained it until Oct. 17, 1918. When they realized they could no longer hold the town, the Germans fired several important parts, and entire destruction was prevented only by the rapid approach of the British 8th division. Douai was again occupied by the Germans in 1940 after the B.E.F. of the Second Great War had delivered a counter-attack between Arras and Douai on May 22. The town was liberated by the British 2nd army on Sept. 2, 1944. See Bible illus.

**Douala.** Town and district of French Cameroons, W. Africa. The town is situated on the Cameroons river about 18 m. from the sea, and is the chief seaport of Cameroons. Douala proper, *i.e.* the port and European quarters, occupies the site of the former Bell Town. Akwa is a large native centre and Dido the residential quarter for the native clerks and workmen employed at the port. These three towns, known collectively as Douala, represented the headquarters of the three native chiefs at the time of the German occupation in 1884.

Douala occupies a position of great importance with respect to maritime trade in W. Africa. The Northern rly. runs from Bonaberi, opposite Douala, northward, and will eventually be prolonged to a point on the Shari river. The Midland rly. leaves Douala in a southerly direction and runs to the Njong river. Douala may become the main outlet for French Equatorial Africa and the Lake Chad region. There is an extensive trade in palm oil and palm kernels, cocoa, and rubber. Douala was captured by a combined British and French force on Sept. 27, 1914. Pop. of district, 77,000; of town, 22,000. See Cameroons.

**Douarnenez.** Town of France. In the dept. of Finistère, it stands on Douarnenez Bay, 12 m. W.N.W. of Quimper, and manufactures fishing nets and ropes. There is an active coasting trade, and many of the inhabitants are engaged in the sardine fishery. Shipbuilding is a minor industry. Pop. 20,564.

**Douarnenez Bay.** Inlet of the N.W. coast of France. In the dept. of Finistère, it lies between Brest Harbour on the N. and Raz Point

on the S. It penetrates inland about 12 m., and is 6 m. wide at its entrance.

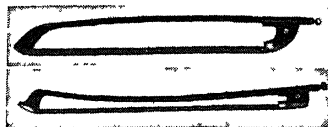
**Double.** Word used in several senses, notably for a person who closely resembles another. It is sometimes also used for a ghost. In a military sense, to double is to break into a slow run, *i.e.* a double march. To bring off a double is to back the winners of two big horse races, usually at a cumulative stake, *e.g.* the spring double, Lincolnshire Handicap and Grand National; Epsom double, Derby and Oaks; autumn double, Cesarewitch and Cambridgehire. Doubles at lawn tennis and similar court games are matches of two partners against two others—all men, all women, or mixed teams. At bridge a double, according to circumstances, is either an invitation to one's partner to make an overcall (take-out double), or a challenge to the declarer to make his contract (business double), which increases his reward for success or penalty for failure. In other card games, a double by dealer or banker requires the other players to put up double stakes.

**Double-acting Engine.** Mechanism in which pressure acts alternately on each side of the piston during both instroke and outstroke. Both ends of the cylinder must be sealed, and a piston-rod is necessary, passing through a stuffing box which prevents leakage past the rod to the atmosphere. In single-acting engines the pressure of the working fluid (steam, gas, or water) acts on one side of the piston for the outstroke only, the other side being exposed to atmospheric pressure. This simplifies construction of the engine, but limits the amount of power obtainable from a cylinder of a given size.

Steam engines are invariably double-acting, while the large majority of internal combustion engines are single-acting, since these work at much higher pressures and temperatures and problems of leakage and cooling are much more acute. Where great power is involved, however, as in marine oil engines with only a restricted space available, the engine is made double-acting. If also the two-stroke cycle is employed, considerably more power may be obtained than with the four-stroke cycle. Difficulties arise in connexion with adequate cooling, efficient scavenging of the exhaust gases, and correct

injection of the fuel, but these have been mostly overcome. Different types of both four-stroke and two-stroke double-acting engines are in operation, one of the largest developing 12,000 h.p. at 120 r.p.m. in 10 cylinders. See Diesel Engine.

**Double Bass,** sometimes called the bass. Largest and heaviest toned of the orchestral stringed instruments played with a bow. In



Double Bass. Short bow; upper picture, old-fashioned light bow

shape it appears to be a survival of the viol family, having the sloping shoulders and usually the flat back which characterise the viols. Double basses have three or four

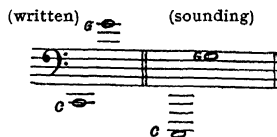


strings, tuned as above. Their sounds would thus come an octave lower than the notes written, so that when the violoncello (*q.v.*) and the double bass play from the same notes the effect is of octaves instead of unisons, thus:



The bow retained its medieval shape until recently.

**Double Bassoon** OR CONTRA FAGOTTO. Largest and deepest toned of the wood-wind instruments, bearing the same relation to the ordinary bassoon as the stringed double bass does to the violoncello, but used much more rarely. It is a modern development of the bass shawm or pommer of the Middle Ages, made more convenient for handling by having the tube doubled twice. The side holes are all closed by keys. The useful compass is about



including all intermediate semitones, but skilled players can get

down to B flat below this lower note, and also reach a few notes above the upper G. The double bassoon is used in military bands as well as in orchestras.

**Double Chant.** Chant consisting of four phrases, introduced after the Restoration of 1660. The earlier Anglican chants, single chants, had two phrases only. *See* Chant.

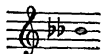
**Double Concerto.** Musical composition scored for two solo instruments and orchestra. Examples are by J. S. Bach for two harpsichords and for two violins; by Mozart for violin and viola; by Brahms and by Delius for violin and violoncello.

**Double Counterpoint.** Counterpoint (*q.v.*) which will flow equally well with the parts inverted.

**Double Entry.** Method of book-keeping so called because every item is entered twice in the ledgers, once on the credit and once on the debit side. The totals, therefore, will always balance, unless an error has been made. It is this fact that makes this form of book-keeping so useful. *See* Book-keeping.

**Double Flat.** In music, a double flat (♭♭) lowers the note to which it is prefixed two semitones. Thus, on keyboard instruments

B double flat



has the same sound as



In theory, this is not quite accurate, but in practice it serves well enough. The double flat (♭♭) is contradicted by ♯♭, or simply ♭. *See* Flat.

**Double Refraction.** Properly possessed by some minerals. All crystallised substances may be divided into two principal optical classes: isotropic in which light rays have the same velocity no matter what the direction of its vibration; (2) anisotropic, in which the velocity varies with the direction of vibration. In isotropic substances, when light passes from one medium to another the light wave is merely bent on a change in velocity. In anisotropic media, there are two wave systems set up, each travelling with a different velocity. All anisotropic substances are doubly refracting; the degree is technically expressed as the strength of their double refraction, or their birefringence.

This property is shown by all minerals of tetragonal, orthorhombic, monoclinic, and triclinic systems. Calcite is an example; and the high strength of its double refraction explains its use in the Nicol prism (*q.v.*). *See* Optics; Refraction.

**Double Sharp.** In music, the opposite of a double flat, raising a note two semitones. Its sign is a cross (×) instead of two ordinary sharps (♯♯). The double sharp (×) is contradicted by ♯♯ or simply ♯. *See* Sharp.

**Double Shear Steel.** Type of cutting steel originally used for making cloth cutter's shears. It is still employed for knives of superior quality, owing to its keen cutting edge after hardening. Shear steel is made by piling together and then forging cemented bars or blister bars each about 18 to 20 ins. long. The quality may then be improved by hammering the steel, breaking it through its centre, doubling it back on itself, reheating and re-forging to the required size. The product obtained, double shear steel, is more uniform in composition, and when hardened has a keener cutting edge. *See* Blister Bar; Steel.

**Double Standard.** In ethics, a demand for a higher standard of social and particularly sexual conduct on the part of women than is expected from men.

**Double Star.** For discussion of this phenomenon in astronomy, *see* Binary Star.

**Double Summer Time.** A measure introduced in Great Britain in 1941 by which in Great Britain the clocks were advanced



Doubloon. Spanish American gold doubloon, dated 1687  
One-half actual size

two hours (instead of the one hour imposed by Summer Time). Its object was to save fuel and increase industrial production by the maximum use of daylight. The periods of double summer time for the war years were: 1941, May 4–Aug. 10; 1942, April 5–Aug. 9; 1943, April 4–Aug. 15; 1944, April 2–Sept. 17; 1945, April 2–July 15. It was revived in 1947, from April 13–Aug. 10, again to save fuel. *See* Summer Time.

**Doublet or Pourpoint.** Tightly fitting body garment worn by men,



Doublet. Front view of the garment as worn in the 16th century

reaching from the neck to a few inches below the belt. Worn from the 14th to the 17th century, it probably took its name from the fact that it was double and padded (*see* Bombast). The sleeves were sometimes separate articles attached to the

shoulder with strings. *See* Costume.

**Double Tenth.** Name sometimes given to the tenth of October (10th month), referring especially to Oct. 10, 1911, when the revolution broke out at Hanyang which was to inaugurate the Chinese republic.

**Doubling.** Conversion of single-strand yarn into ply yarns, whether two-fold or a larger number of folds. A cotton doubler receives single yarn from the spinning mill and turns it out as plied, cabled, or fancy yarn.

In drawing or reducing worsted preparatory to spinning, doubling takes place when slivers of partly drawn material are combined together and re-drawn to equalise the composition of the whole. *See* Spinning.

**Doubloon** (Span. *doblón*, double). A Spanish gold coin originally worth two pistoles, or about 34s. Another doubloon, the *doblón de Isabel*, value 20s. 8d., was issued 1848–68.

**Doubs.** River of France. A tributary of the Saône, it rises in the Jura Mts. and follows a very winding course until it falls into the larger river at Verdun, Saône-et-Loire. For some little way its course is in Switzerland, and for about 30 m. it divides France from that country. On it stands the frontier town of Pontarlier, larger places on its banks being Besançon and Dôle. It flows through some wonderful mountain scenery, and forms the lake of Chaillexon. Its length is 260 m. Part of its course is included in the Rhine-Rhône canal. Its chief tributary is the Loue. *See* Besançon illus.

**Doubs.** Department of E. France. Named from its chief river, it has Switzerland as a frontier on the E. and N.E. Its area is 2,052 sq. m., and it is divided into four arrondissements. Mainly moun-

tainous, with a section of the Jura Mts., it has a plain in the N. There the soil is fertile and the agricultural output includes cattle and dairy produce, especially cheese, as well as wheat, oats, wines, fruit, etc. Elsewhere the ground is not very productive. Much of it is forest land, while peat bogs are numerous. Building stone, iron, gypsum, and salt are found. In addition to the Doubs the chief rivers are the Dessoubre and the Loue. Besançon is the capital; other towns are Montbéliard and Pontarlier. Before the Revolution much of the dept. was part of Franche Comté. Pop. 298,255.

**Douche** (Fr., shower bath). Jet or current of water directed upon the body or its cavities for purposes of cleansing or treatment. Astringent or antiseptic substances may be thus used.

**Doughty**, CHARLES MONTAGU (1843-1926). A British author. He was born Aug. 19, 1843, and



Charles Doughty,  
British author

as a young man indulged his love of travel by wandering through Europe and N. Africa. In Nov., 1876, he started from Damascus with a pilgrim caravan, later attaching himself to groups of wandering Bedouin, reached the oasis of Khaibar, and after enduring hardships and perils gained the Arabian coast at Jidda, Aug., 1878. Ten years later he published *Travels in Arabia Deserta*. Of great general interest for its descriptions of an unknown country, and of archaeological and geological importance, this work was above all notable for the creation of a new prose style, based on the principle of Elizabethan simplicity. Doughty's later output was exclusively poetic, and included *The Dawn in Britain*. 1906; *The Titans*, 1916; and *Man-Soul*, 1920. In all three works the same qualities of style are apparent. Doughty died Jan. 20, 1926. An abridged edition of *Arabia Deserta* was published that year. There are biographies by B. Farley, 1927; D. G. Hogarth. new ed. 1932.

**Douglas**. American aircraft co. founded by Donald W. Douglas in 1920. Four years later Douglas aircraft of the U.S. army completed the first round-the-world flight. In the Second Great War the factories

at Santa Monica, Calif., and elsewhere, produced a succession of outstanding military aeroplanes, notably the Boston (*q.v.*), Havoc (*q.v.*), Dakota (*q.v.*), and Sky-master (*q.v.*).

**Douglas**. Capital of the Isle of Man, a mun. bor. and a watering-place. It stands on Douglas Bay, at the union of two streams, the Dhoo and the Glass. Among its attractions are a promenade, 2 m. long, good sands, bathing, and boating. It has three piers and a harbour, public baths, and facilities for all kinds of sport. Dancing halls are a feature, and there are several theatres and cinemas.

S. George's, built 1761-80, is the oldest of the churches; other are S. Thomas's, S. Ninian's, and a fine R.C. church. The buildings used by the government of the island include the legislative buildings and court house; there are also the town hall, public library museum, and art gallery, while the corporation, one of mayor, aldermen, and councillors on the English model, owns the water supply, market, tramways, drainage system, etc. Douglas is connected by steamer with Liverpool, Fleetwood, Barrow, Glasgow, Belfast. Electric tramways connect it with Ramsey and Laxey. The Villa Marina, an estate of eight acres, has been bought and the grounds laid out. Visitors go to Douglas Head, a promontory with a lighthouse at the S. of the bay, reached by a steam ferry from the pier. In the bay is a tower of refuge.

Douglas was made a mun. bor. in 1895. It was a mere fishing village until its value as a health resort made it popular in the 19th century. During the Second Great War an internment camp for civilian enemy aliens was established here. The town was also a boys' training centre for the Royal Navy, headquarters of the R.A.F. No. 1 school of ground gunnery, an R.A.F. regiment depot, and had a school for aircraft recognition. Market day, Sat. Pop. 20,012.

**Douglas**. Parish and village of Lanarkshire, Scotland. It stands on Douglas Water, 11 m. S.S.W. of Lanark, with a rly. station. Of the 12th century church of S. Bride, the burial place of the Douglas family, the choir and spire survive, while of the ancient castle (Scott's Castle Dangerous) the tower alone remains. Coal is worked in the vicinity. Pop. 2,948.

**Douglas**. Famous Scottish family, now represented by the dukes of Hamilton and Buccleuch, the marquess of Queensbury, the earls of Home and Morton, and others. The name is taken from Douglas in Lanarkshire, and the word in Gaelic means dark water. The earliest lands of the family were in Lanarkshire, some being still owned by the earl of Home, but the great power of the Douglasses was in Galloway.

In the 12th century there lived a William of Douglas, whose grandson, Sir William, being the chief man in that place, called himself lord of Douglas. He owned land in seven counties, as also in



Douglas, Isle of Man. View of this popular holiday resort from Falcon Cliff, showing the sands and the two-mile-long promenade  
Courtesy of L. M. S. Rly.

Northumberland. He was Edward I's prisoner when he died, 1298. More famous was his son, Sir James, known as the Good, and also as the Black, Douglas. He was a staunch friend of Robert Bruce, and led many raids into England. His deeds are told by Froissart and Scott. He was killed in Aug., 1330, in Spain, on the way to the Holy Land.

The Douglas lands came after a time to Sir William Douglas, made earl of Douglas in 1358, and through his wife also earl of Mar. He, too, was actively concerned in feuds and warfare. His son James was a son-in-law of Robert II, and is the Douglas of the ballad of Chevy Chase and the battle of Otterburn. He left no legitimate sons; his lands, with the earldom, passed to a natural son, Sir James Douglas, called the Grim, a great figure on the marches of Scotland.

His son Archibald, 4th earl, was made duke of Touraine by the French king, and was killed at Verneuil in 1424. William, 6th earl, was put to death when quite a youth in 1440, and for a time the family power was broken, this being the object sought by the rulers of Scotland. Some of the estates were seized by the crown; to others, and also to the earldom, a kinsman, James, succeeded. Then came his son, William, who, by marrying a cousin, added another Douglas property to his lands. He was murdered by James II, and with the death of his brother in 1488 the main branch of the family and the title of earl of Douglas became extinct.

The family, however, flourished in other branches. The 1st earl had an illegitimate son, George, who became earl of Angus. The 4th earl obtained some of the Douglas lands when they were forfeited in 1455. The 5th earl of Angus was Archibald, known as Bell the Cat, a great figure of his time, and the 6th was the husband of Margaret Tudor, widow of James IV, and sister of Henry VIII. From him the title passed eventually to William, the 11th earl, who was made marquess of Douglas, 1663.

In 1703 the 3rd marquess was made duke of Douglas. He died without sons in 1761, his death leading to the famous Douglas peerage case between the two sons of the duke's sister and the duke of Hamilton. The sons were said to be impostors, but in 1769 the survivor won his case before the house of lords. He was made Baron Douglas in 1790. Another branch represented by the earl of

Morton is descended from Sir James Douglas of Dalkeith. The dukes of Queensberry of the past were descended from Sir James Douglas of Drumlanrig, as is the present marquess of Queensberry. Castlemains Douglas in Lanarkshire is the property of the earl of Home. In the town of Douglas is the church of S. Bride in which many of the Douglases are buried. See Hamilton, Duke of; Home, Earl of; Queensberry, Marquess and Duke of.

**Douglas, LORD ALFRED BRUCE** (1870-1945). British poet. A son of the 8th marquess of Queensberry, he was born Oct. 22, 1870, and educated at Winchester and Magdalen College, Oxford. As a young man he was exceptionally brilliant, and became a close



Lord Alfred Douglas, British poet

friend of Oscar Wilde (*q.v.*). As a result of the Wilde trial in 1895, he became embittered and quarrelsome; in 1923 he was imprisoned for a libel on Winston Churchill. His first book of poems, *The City of the Soul*, 1899, while revealing the influence of Rossetti and Dowson, showed him as a poet of remarkable promise. He imposed upon himself a poetic form of the most rigid discipline, *i.e.* the Petrarchan sonnet; the sonnet-sequence *In Exile*, 1924, was his most mature as well as his finest achievement as a purist. Editor of *The Academy*, 1907-10, he started in 1920 a weekly paper, *Plain English*, with which *The Academy* was incorporated. His other works include *Oscar Wilde and Myself*, 1914. Collected Poems appeared in 1919; *Autobiography* in 1931, in which year P. Braybrooke published *A Life and Work*. Lord Alfred died at Lancing, March 20, 1945.

**Douglas, SIR CHARLES** (d. 1789). British sailor. Descended from a younger son of the 6th earl of Morton, he entered the navy and was promoted lieutenant in 1753. In 1759 he served in the *St. Lawrence* and at Quebec, and in 1775 forced a passage through the ice-bound *St. Lawrence* and relieved Quebec, for which service he was made a baronet in 1777. In the *Formidable* he accompanied Sir George Rodney to the *W. Indies*, and the victory of the *Saints* (1782) was largely due to his advice. In 1783 he was com-

mander-in-chief in *N. American waters*, being there until 1786. In Jan., 1789, he was again appointed, but in Feb. he died suddenly. Douglas introduced many improvements in naval gunnery.

**Douglas, CLIFFORD HUGH** (b. 1879). A British engineer and economist. Born Jan. 20, 1879, and educated at Pembroke College, Cambridge, he became chief engineer to the British Westinghouse company in India and helped to build the Buenos Aires and Pacific rly. in *S. America*. After the First Great War he went to Canada. There Major Douglas, in books about his system of social credit, secured a reputation as an economist, and was called as a witness by the Macmillan committee in 1930. He saw the cause of social and economic ills in the failure of industry to distribute in wages enough money to buy back production. In 1935 as chief reconstruction adviser to the government of Alberta he introduced a scheme by which each citizen was to receive a basic monthly dividend of 25 dollars in non-negotiable certificates. A proposal by the provincial government in 1938 to adopt the full social credit programme was vetoed by dominion authorities. See *Social Credit*.

**Douglas, GAWIN OR GAVIN** (c. 1474-1522). Scottish poet and bishop. Son of the 5th earl of Angus, educated at *St. Andrews*, he became bishop of Dunkeld in 1515, and in 1520, on the fall of his nephew, the 6th earl, he fled to England and died suddenly in London of the plague. He was buried in the church of the Savoy. Douglas wrote two allegorical poems, *The Palace of Honour*, owing something to Chaucer, and *King Hart*. His translation of Virgil's *Aeneid* into Scottish verse was the earliest into any British dialect. Douglas's works were edited by John Small, 4 vols., 1874.

**Douglas, JAMES** (1867-1940). British journalist. He was born in Belfast, Feb. 9, 1867, and after a long journalistic career was appointed editor of the *Star*. In 1920, on the formation of the *Sunday Express*, he became its editor, a position he retained until 1931. In weekly articles, which he continued after he had left the editorship, he constituted himself an emotional guardian of contemporary morality, particularly in the arts. His publications included *The Man in the Pulpit*, 1905; *Down Shoe Lane*, 1930; *The Bunch Book*, 1932. He died Sept. 25, 1940.



**Douglas, JOHN WILLIAM HENRY THOMAS** (1882-1930). An English cricketer. Born Sept. 3, 1882, he was educated at Felsted and excelled as a boxer; he won the middle-weight amateur title at the 1908 Olympiad. Playing cricket for Essex from



**J. W. H. T. Douglas,**  
English cricketer

1901, he was captain from 1911. In the M.C.C. tour of Australia, 1911-12, he became captain on P. F. Warner's illness, and was chosen captain in 1920-21. During the Australian visit in 1921 he was superseded by Lionel (Lord) Tennyson. Douglas was a good fast bowler and a valuable defensive batsman (an Australian wag said his initials stood for Johnny Won't Hit To-Day). He met an heroic death in the North Sea, trying to save fellow-passengers in a shipwreck, Dec. 19, 1930.

**Douglas, LEWIS WILLIAMS** (b. 1894). American diplomat, born July 2, 1894, at Bisbee, Ariz. After education at Amherst College and Massachusetts institute of technology, he was elected to the Arizona state legislature in 1923. In 1926 he entered the house of representatives as a Democrat, and in 1933 joined F. D. Roosevelt's administration, but resigned after 18 months. Principal and vice-chancellor of McGill University, Canada, 1938-39, and president of the Mutual Life Insurance co. of New York, 1940, he was in London in 1942, assisting with lease-lend, and later became deputy director of the U.S. war shipping administration. In 1945 he helped to organize policy in the U.S. occupation zone of Germany. He was appointed U.S. ambassador to Great Britain, Feb. 26, 1947.

**Douglas, NORMAN** (b. 1868), British author. He published his first collection of short stories, *Unprofessional Tales*, in 1901, and *Siren Land* in 1911. With *South Wind*, 1917, he established his reputation as a brilliant satirist. A psychological study of island society (the scene of the novel suggested Capri), *South Wind* became a modern classic and inspired a school of imitators. Douglas's deep knowledge and appreciation of the Mediterranean countries pervaded much of his work. Later books included *Together*, 1923; *Experiments*, 1925; *Old Calabria*, 1928; *Late Harvest*, 1946. He

published an autobiography, *Looking Back* (2 vols.), 1933, and an *Almanac*, 1945.

**Douglas, STEPHEN ARNOLD** (1813-61). American politician. Born at Brandon, Vermont, April 23, 1813, the son of a doctor, he settled in Illinois, and as a lawyer had soon a large practice. He became a leader among the Democrats; in 1836 he entered the legislature of the state; in 1840 was its secretary, and in 1843 was sent to the house of representatives. He remained there until 1847, and from then until his death he was a member of the senate.

Douglas took a vigorous part in every controversy, and was especially keen on advocating extension of territory, whether by conquest or expansion. On the slavery question Douglas was from the first a supporter of the doctrine of popular sovereignty, i.e. the right of each state to decide for itself whether it would have slaves or not. This was the policy of the measure of 1854 by which, in opposition to the Missouri Compromise (g.v.), Kansas and Nebraska were admitted to the Union, and of it Douglas was the author.

In 1858 began his verbal duel with Lincoln, by which he is perhaps chiefly known. Both were candidates in Illinois for the senate, the contest between them being made more piquant by the physical contrast between the tall, gaunt figure of Lincoln and the tiny frame of "the little giant." They met in debate in various places, Douglas declaring for popular sovereignty; Lincoln for the right of the Union to abolish slavery in any state. Douglas won the seat; and then in 1860 the two were again pitted, this time for the presidency, Douglas being badly beaten. When war broke out, Douglas supported Lincoln in opposing secession. He died at Chicago, June 3, 1861. Consult S. A. D.; a study in *American Politics*, A. Johnson, 1908.

**Douglas Fir** (*Pseudotsuga douglasii*). Tall evergreen tree of the family Coniferae. A native of N. America, it attains a height of 100-300 ft. Its needle-like leaves are flat, with two white lines on the lower surface, and are spirally arranged on the twigs. The pendulous, oval cones, which vary in length from 2-4½ ins., have scales with three-pronged ends, of which the middle prong is much longer and narrower than the others. A specimen 214 ft. in height was made into a flagpole standing in Kew Gardens, Surrey. The deep yellow timber is strong and durable.

**Douglas of Kirtleside, WILLIAM SHOLTO DOUGLAS, BARON** (b. 1893). British air officer. Born



**Lord Douglas,**  
British air force  
officer

Dec. 23, 1893, he was educated at Tonbridge and Lincoln College, Oxford. In 1915 he served in the R.F.C., and later commanded No. 22 wing, H.Q. A squadron leader from 1920, he was commander R.A.F. station, North Weald, 1928; instructor at Imperial Defence College, 1932-35; director of staff duties, air ministry, 1936-37; deputy chief of air staff, 1940.

In Nov., 1940, he took over fighter command, and next year was knighted. He introduced intruder aircraft operations: pilots of fighter command went over to enemy air bases at night and waited for opportunities to strike at German bombers returning from, or setting out on, raids. In 1944 Sir Sholto became A.O.C.-in-C., coastal command. In 1945 he was air c.-in-c., British air forces of occupation. Promoted marshal of the R.A.F., 1946, he followed Lord Montgomery that year as c.-in-c., British forces in Germany, and military governor of the British zone until 1947. Raised to the peerage in 1948, he was appointed chairman of B.E.A. in 1949.

**Douglass, EARL** (1862-1931). American geologist. Born at Medford, Minnesota, Oct. 28, 1862, he was educated at the university of Dakota. For some years he was a teacher, devoting himself also to geology and palaeontology, on which he began to lecture in the university of Montana in 1890. From 1900 to 1902 he was a fellow of Princeton. In 1901 he began research work in the domain of vertebrate palaeontology under the auspices of the Carnegie museum at Pittsburgh, and in 1909 he made a valuable discovery of dinosaurs near Jensen, in Utah. He died Jan. 13, 1931.

**Douglass, FREDERICK** (1817-95). American anti-slavery lecturer. A mulatto, his mother being a negress, he was born at Tuckahoe, Maryland, and brought up as a slave. Having escaped from his master, a Baltimore shipbuilder, in 1838, by a speech at Nantucket he attracted the notice of the Massachusetts anti-slavery society, which appointed him one of its lecturers. In England, 1845-47, he did

much to enlist sympathy with his campaign for the abolition of slavery. He was the founder of two successful newspapers, the *North Star*, 1847, renamed (1850) *Frederek Douglass's Paper*; and the *New National Era*, 1870. He was U.S. minister to Haiti, 1889-91. He died Feb. 20, 1895.

**Doukhobors** or ДУКХОБОРЫ. A Christian community of non-conforming peasants established in Russia in the middle of the 18th century. The sect practises peace and equality and is opposed to military service. Adherents counsel silent prayer and attach small weight to outward ceremony. Their refusal to recognize man-made laws led to banishment to Transcaucasia by Nicholas I in 1850. In 1895 the male members of the sect were called up for service in the Russian army and showed disapproval by burning their weapons and equipment; they were relentlessly persecuted by the Russian government.

Through the offices of Count Tolstoy and the Society of Friends in England the Doukhobors were permitted to emigrate from Russia in 1899. Eventually about 15,000 settled in British Columbia and Saskatchewan, where the Canadian government granted them 450,000 acres. Though the dominion later took back 360,000 acres, the Doukhobors became a wealthy community and now own property valued at \$5,000,000. The sect frequently fell foul of the law in Canada by parading naked, refusing to pay taxes, and burning schools and bridges. In 1945, at a convention at Vancouver they renounced their more extreme practices. The name means spirit fighters, and was applied to the sect by the Russian Orthodox church as a suggestion that Doukhobors warred against the spirit of God.

**Doullens.** Town of France, in the dept. of Somme. It is 17 m. by rly. S.W. of Arras, on the river Authie, and is normally the centre of a trade in phosphates. During the First Great War its central position behind the British lines made it important, and it was here that, after the retreat of March, 1918, the Allied powers placed Foch in supreme command, March 26. A cemetery contains 1,700 graves of British soldiers.

**Doulton, SIR HENRY** (1820-97). A British pottery manufacturer. Born in Lambeth, July 25, 1820, he was educated at University College School, and joined the business of his father, a potter. About 1867 the firm began to

make the ware by which the name is widely known. In 1897 the firm employed over 4,000 persons, and had branches at Burslem, Paisley, Paris, and elsewhere, in addition to the large works at Lambeth. A school of art was opened in connexion with the business. Doulton, who was knighted in 1887, did a great deal to develop artistic pottery. He died Nov. 18, 1897.

**Doulton Ware.** China, stone, and earthenware manufactured in the Doulton potteries at Lambeth, Burslem, Rowley Regis, St. Helens, and Paisley. The firm was founded in 1815, when John Doulton and John Watts acquired an interest in a small pottery in Vauxhall Walk, Lambeth. Doulton had served his apprenticeship at Fulham Pottery, once the working place of John Dwight, master potter of the 17th century. In 1820 Doulton and Watts became sole owners of the business, and in 1826 moved from Vauxhall Walk to Lambeth High Street.

At first the firm was solely concerned with turning out salt-glazed stoneware for industrial and domestic purposes. About 1860, however, Henry, son of John Doulton, started experiments in the production of enamel glaze. At the London international exhibition in 1862 he showed products of a strictly utilitarian nature, well formed but simply decorated vases, jugs, etc. About 1867 came pieces decorated by the sgraffito method—scratched ornamentation filled in with colours. Later, the ornamentation was applied by thin layers of coloured clays, which led to the adoption of the *pâte-sur-pâte* process.

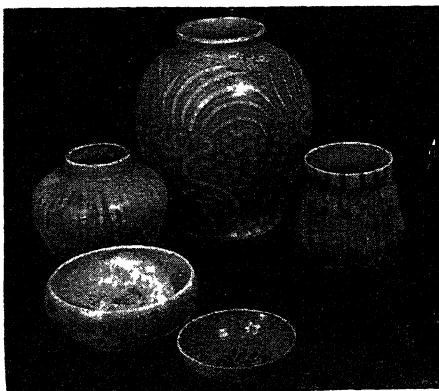
The manufacture of architectural terra-cotta, medallions, and little figures, also faience, was next introduced. The "Lambeth faience" art ware came in 1872; this has a softer body, the biscuit being dipped in coloured glazes and again fired. "Carrara" was first introduced for decorative pieces, but was soon adapted to architectural work. It has a hard, white body, covered with an opaque egg-shell enamel, which takes subdued colours. Dry impasto or vitreous fresco, used for wall decorations, has no gloss, the coloured enamels being painted on terra-cotta slabs.

Stoneware polychrome, having a harder body, and the enamels being painted in clay slabs or blocks before firing, is suitable for outdoor work. Both types are decorated with conventional designs as well as with all kinds of figure pieces.

In 1877 Doulton's acquired an old-established earthenware pottery at Burslem. Here, after long and patient research, secrets of glazing, once known to the old Chinese but hitherto baffling Western potters, were rediscovered. In 1884 the Lambeth works began the manufacture of fine bone china. In 1885 the Society of Arts awarded Henry Doulton the Albert Medal, and two years later he was knighted.

Different methods of decoration are often used on the same pieces of Doulton ware, the sgraffito and *pâte-sur-pâte* and coloured slip framing to hand-painted panels being frequently combined in order to produce desired effects. In all this art work Sir Henry Doulton took a leading part, introducing modellers and painters from the adjacent Lambeth school of art. Most important pieces are signed with the initials of the artists, among whom are numbered George Tinworth (specially known for his modelled figure ware and terra-cotta slabs), the Misses Barlow, W. Gandy, and J. Broad.

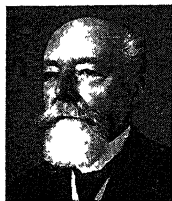
In 1925 the production of stoneware pipes was transferred from the original works at Lambeth to a new pottery at Erith, where soon another pottery was established to make large chemical stoneware plants. A rail insulator for use on electric railways, introduced by Doulton's in 1904, is now standard for London underground rlys. and electrified lines at home and abroad. Doulton's



Doulton Ware. Pots and bowls in Lambeth salt-glazed stoneware

developed new stoneware bodies, including heat and thermal shock-resisting stoneware, and special porous ceramic media for filtration, aeration, and electrolytic processes. Standardised insulators are made for switchgear, marine broadcasting, bathing room installations, etc. Doultton House, on a site near Lambeth bridge, was completed in 1940. *Consult:* A. B. C. of English Salt-glazed Stoneware from Dwight to Doultton, J. F. Blacker, 1922.

**Doumer, PAUL** (1857-1932). French statesman. Born at Aurillac, March 2, 1857, he became a professor of mathematics, a journalist in Paris, and was elected a deputy in 1888. As finance minister in 1895 he tried vainly to impose an income tax. He was a successful governor-general of Indo-China, 1897-1902. He was president of the chamber in 1905, defeated by Fallières for the presidency of the republic, became a senator in 1912, a minister of state in 1917, and chief of the senate 1927. Elected in 1931 to succeed Gaston Doumergue (*v.i.*) as president of France, he enjoyed office only a few months, being shot dead by a crazy fanatic, Gorguloff, on May 8, 1932. *Pron.* Doo-mair.



Paul Doumer, French statesman

**Doumergue, GASTON** (1863-1937). French statesman. He was born at Aigues-Vives, near Nîmes, Aug. 1, 1863, and after being educated at the lycée of Nîmes entered the legal profession. In 1893 he was elected to the chamber of deputies as member for Nîmes, becoming minister for the colonies in 1902. Senator from 1910, Doumergue held various offices under many leaders before being elected president of the senate in 1923. In June, 1924, he succeeded Millerand as president of the republic, being the first Protestant to hold that office. Retiring into private life at the ex-

piration of his term, 1931, Doumergue was recalled as prime minister after the Stavisky riots of Feb., 1934. He balanced the budget by drastic economies, but in Nov. a new crisis was provoked by his insisting on a scheme of parliamentary reform. His cabinet fell and he retired once more, dying at Aigues-Vives June 18, 1937. *Pron.* Doo-maig.

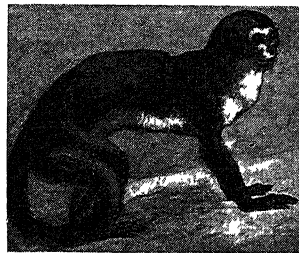
**Doune.** Police burgh of Perthshire, Scotland. It stands on the Teith, which is here crossed by a twin-arched bridge erected in 1535, 45 m. N.W. of Edinburgh, on the railway. Doune Castle, now a ruin, was occasionally a royal residence, and was defended for Prince Charles by a nephew of Rob Roy, 1745 and dismantled after the battle of Falkirk, 1746. Pop. 822.



Douw. The Young Mother, typical of this Dutch painter's work

**Dourine.** Disease of horses caused by a trypanosome resembling those causing sleeping sickness in man. It is a serious menace in parts of Africa, and is passed from one animal to another at mating.

**Douro** (Sp. *Duero*; anc. *Durius*). River of Spain and Portugal. Rising in the prov. of Soria, S.E. of Burgos, it curves E. and S., then flowing S.W. past Soria, Valladolid, and Zamora, enters Portugal, of which it forms the frontier for 65 m. Running W. for most of its length, it enters the Atlantic near Oporto, after a course of 485 m. With its tributaries, of which the chief are the Esla, Pisuerga, Tua, and Tormes, it drains an area of some 37,000 sq. m. Much impeded by rapids, it is navigable for about 90 m.; is subject to inundations, and its mouth is partly blocked by a bar. It abounds in trout, lampreys, and shad. Its lower course is used for transporting wine from the Paiz do Vinho by sailing-boats to Oporto.



Douroucouli. *Nyctipithecus trivirgatus*, a South American monkey

**Douroucouli.** Group of small nocturnal monkeys, common in South America. They are thick and compact in body, with close fur and rather bushy tails, round heads, and large eyes. The eye-

sockets occupy almost the entire width of the skull. The thumb is relatively short. They live in trees and feed on insects. *See* Monkey.

**Douw** or **Dow, GERARD** (1613-75). Dutch painter. He was born at Leyden, April 7, 1613, studied under the engraver Dolendo, and the glass-painter Pieter Kouwenhoven, and finally entered Rembrandt's studio, where he learned much of his master's treatment of light and shade. Later, however, he developed a minuteness in his work that precluded more than a general application of Rembrandt's principles. The pseudo-realism of his genre pieces has been likened to the pseudo-democracy at that time of the Dutch republic. His paintings include *Dropsical Woman* (Louvre), *Young Man* (The Hague), *Poulterer's Shop* (National Gallery, London). Douw died Feb. 9, 1675.

**Dove.** Name applied vaguely to various species of pigeon (*q.v.*). In Great Britain the stock dove, rock dove, and turtle dove are familiar examples.



Dover, Kent. View from the cliffs (1946), showing the harbour and, left, Dover Castle, standing 375 ft. above the sea. Within the castle precincts are the remains of a Roman lighthouse and a Saxon fortress, while the keep is Norman

**Dove.** Symbolic representation of the Holy Ghost. From an early period the dove has been thus used in Christian art, in accordance with S. Luke's narrative (3, v. 22) of the baptism of Jesus. It was painted white as the emblem of purity, and sometimes a nimbus was placed round its head. Its figure may be seen on many baptismal fonts, and in Roman Catholic churches the pyx, or box which holds the Host, is frequently made in the form of a dove.

**Dove.** British aeroplane type, designed by the De Havilland co. Known also as the D.H.104, the Dove was introduced shortly after the end of the Second Great War for feeder air-lines or similar civil use. Fitted with two D.H. Gipsy Queen engines of 330 h.p., the Dove was a low-wing monoplane (span 57 ft.) with single fin and rudder and retractable tricycle undercarriage. It accommodated 11 passengers and had a maximum speed of 200 m.p.h.

**Dove.** River of Derbyshire and Staffordshire, England. It rises on Axe Edge and flows between the two counties in a S. and S.E. direction to join the Trent after a course of 45 m. Some of the upper reaches are National Trust property. Dove-dale is a famous beauty spot. The lower course meanders through alluvial marshes.

**Dove.** HEINRICH WILHELM (1803-79). A German scientist. Born in Liegnitz, Oct. 6, 1803, he was in 1826 professor at Königsberg. From 1829 he held a professorship in Berlin, and in 1848 was appointed director of the newly established Royal Meteorological Institute. He died April 4, 1879. His main work was the study of meteorology, on which he wrote many treatises.

**Dove-flower** (*Peristeria elata*). Blossom of an epiphytal plant of

the family Orchidaceae. A native of Central America, it is the *Esperitu Santo* or Holy Ghost flower of the Spaniards. The central parts of the white flower bear a resemblance to a dove with extended wings.

**Dover.** Mun. bor., seaport, and market town of Kent, England. One of the Cinque Ports, it stands on the Strait of Dover, 77 miles E.S.E. of London by the main line rly. It is the port of departure for the mail-packet service to France, and a port of call for trans-Atlantic and other liners.



Dover arms

The castle, situated to the N.E. on a cliff 375 ft. above the sea, has a Norman keep and remains of a Saxon fortress; within its precincts are a pharos or light tower and a fortress church. Among public buildings are the town hall (1883), adjoining the old Maison Dieu founded in the 13th century by Hubert de Burgh; Duke of York's military school; and two ancient and several modern churches. Near the site of the round church of the Knights Templars (enclosed at the beginning of the 19th century) stood the Bredenstone, where was held the court of Shepway. Dover College buildings include a Benedictine gatehouse (1132). The rly. from Folkestone to Dover passes through three tunnels, one being pierced in Shakespeare's Cliff (350 ft.).

The harbour, greatly improved since 1891, is enclosed by the Admiralty Pier (1,360 yds.), the Eastern Arm (1,100 yds.), and the Southern Breakwater (1,430 yds.), the last-named being  $\frac{1}{2}$  m. from shore. The works represent a massive line of masonry  $2\frac{1}{2}$  m. in extent and enclosing 690 acres of

water. Known as the National Harbour, this was opened in 1909. The Prince of Wales Pier was opened in 1903. A train ferry dock completed in 1936 enabled goods and passenger trains to be transported to Dunkirk without unloading. Paper making and flour milling are industries. Market day, Sat. Pop. est. 32,000.

Dover (Dunus or Dubris) has taken a prominent part in English history. Here King John made submission to the pope in 1213; three years later the castle successfully withstood a siege by the French; a naval battle was fought off the coast in 1217, in which the Cinque Ports squadron defeated a fleet commanded by Eustace the Monk. Charles II landed here at the Restoration in 1660. The Treaty of Dover was secretly signed May 22, 1670, between Louis XIV of France and Charles II; the English king was to become a Roman Catholic, assist Louis in his war in the Netherlands, and receive a sum of money in return. A tablet on Dover Castle cliff commemorates the first successful cross-Channel aeroplane flight by Louis Blériot, July 25, 1909, which ended here.

Dover in the First Great War was a naval and military base, a dockyard, and a base for ambulance traffic. In the Second Great War it again became a naval and military base; from here the evacuation from Dunkirk was planned and directed, many thousands of the B.E.F. being landed at the port. A centre of the area of Kent which was called "hell fire corner," Dover suffered considerable damage from German aircraft and even more from shells from long-range guns on the French coast. This cross-Channel shelling began on Aug. 12, 1940, during the battle of Britain, and ceased only

on Sept. 30, 1944, with the capture by the Canadian 1st army of the German batteries in the Calais area. Altogether 2,226 shells fell in the town, 464 H.E. bombs, three flying bombs, and three parachute bombs. Civilian casualties were 226 killed and 760 injured. Caves were used as shelters during these attacks. Among buildings destroyed or seriously damaged were the Grand Hotel, Burlington Hotel, and museum. The clearance of demolished buildings in Market Square led to the excavation of the Roman fort of Dubra. *See Cave, illus.*, p. 1867.

**Dover.** Capital of Delaware, U.S.A., and co. seat of Kent. co. Lying 49 m. S. of Wilmington, on Jones Creek, it is served by rly. and airport. It is the seat of the state college for coloured students. In an agricultural and fruit-growing district, it also makes motor car bodies, rubber products, and hosiery. Laid out by William Penn, it became the capital in 1777 and a city in 1829. Pop. 5,517.

**Dover.** City of New Hampshire, U.S.A. It is on the Cochecho river, at the head of navigation for small vessels, 11 m. by rly. N.W. of Portsmouth. Established 1623, it was the first settlement within the present state boundaries, though part of Massachusetts 1641-92. It became a city in 1855. Cotton and woollen goods, machinery, and shoes are made. Pop. 14,990.

**Dover, STRAIT OF.** Channel between England and France, connecting the English Channel with the North Sea. In its narrowest part it is 21 m. across. Matthew Webb swam across the strait in 1875; the feat was repeated by T. W. Burgess in 1911; other swimmers who crossed are noticed under Channel Swimming. Blanchard and Jeffries crossed it by balloon from Dover to the forest of Guinnes in 1785; Blériot crossed it by aeroplane from Baraques, near Calais, to a field near Dover Castle in 1909. The only weather reports published in the U.K. during the Second Great War referred to conditions in the Strait of Dover. The French equivalent is Pas-de-Calais, also the name of a department.

**Dovercourt.** This seaside resort of Essex is part of the borough of Harwich (*q.v.*).

**Dover Patrol.** Section of the British navy based on Dover and Dunkirk throughout the First Great War. Its immortal exploits were the blocking of Zeebrugge on the night of April 23, 1918, and placing the Vindictive in the en-

trance of Ostend harbour, May 10, 1918. The patrol almost daily fought the enemy along the Flanders coast, its naval siege gun force, with the monitors, providing the main heavy artillery support of the left flank of the Allied army. It kept the ways for merchant vessels passing through the narrow seas, and closed the gate against enemy submarines by maintaining a barrage across the Strait of Dover. In appreciation of the patrol's work, the public subscribed approximately £50,000 to erect memorials at Leathercote's Point, St. Margaret's Bay, Dover, at Cape Blanc Nez, France, and at the entrance to New York harbour.

In the Second Great War, the vigilance of the Dover Patrol played a large part in the defence of Great Britain, as well as in helping to keep open the shipping lanes off the coasts. The patrol of the Channel and watch on the Strait of Dover were carried out mainly by destroyers and light craft. In contraband control all neutral shipping passing through the Strait was examined for contraband cargoes that might be directly or indirectly consigned to Germany. After the invasion of the continent in June, 1944, the patrol helped to protect against submarine and E-boat attacks the convoys supplying the Allied forces. The patrol from Dec., 1939, formed part of the Dover Command, which reverted in July, 1945, to its peace-time status as part of the Nore Command.

**Dover's Powder.** Compound powder of ipecacuanha. It consists of powdered opium, one part; ipecacuanha, one part; and potassium sulphate, eight parts. The dose for an adult is 5 to 15 grains (3 to 10 decigrams). It is helpful if taken at the onset of the common cold.

**Dovey or DYFI.** River of N. Wales. It rises on the E. slope of Aran Mawddwy and flows S. and S.W. through Merionethshire and Montgomeryshire, and then between Merionethshire and Cardiganshire to Cardigan Bay, which it enters by an estuary 6 m. long. Its total length is 30 m. Machynlleth is on the river and Aberdovey at the estuary.

**Dovrefield.** Mountainous plateau of central Norway. It is a continuation of the Kiölen range, and forms the watershed for many Scandinavian rivers. It culminates in Sneehätten (7,620 ft.), the average height ranging from 2,650 ft. to 3,600 ft. It is crossed by the

main road from Oslo to Trondhjem, over a pass 3,445 ft. high. It is the home of Norse folklore and a haunt of superstition.

**Dowager.** Originally, a widow with a dower. The title is usually applied to distinguish the widow of a deceased peer from the wife of the actual holder of the title. Thus the widow of a duke is styled the dowager-duchess, the wife of the new duke becoming the duchess. The title seems to have been first used of Mary Tudor, widow of Louis XII of France. Catherine of Aragon, as widow of Arthur prince of Wales, was called princess-dowager—apparently the first use of the word in England. Of late years the term has fallen into disuse, and the widow is distinguished by prefixing her first name to her title, *e.g.* Helen, duchess of Northumberland.

**Dowden, EDWARD** (1843-1913). British poet and critic. He was born at Cork, May 3, 1843, and educated at Queen's College, Cork, and at Trinity College, Dublin, in which university he became professor of English literature in 1867. In 1889



*Edward Dowden*  
Lafayette

he was Taylorian lecturer at Oxford, and during 1893-96 Clark lecturer at Trinity College, Cambridge. In 1896 he delivered a course of lectures at Princeton, New Jersey; these were published in 1897 as *The French Revolution and English Literature*. He died April 4, 1913. The chief of his numerous works are *Shakespeare: a critical study of his Mind and Art*, 1875; *Life of Shelley*, 1886; *Introduction to Shakespeare*, 1893; *History of French Literature*, 1897. *Consult his Letters*, ed. E. D. and H. M. Dowden, 1914.

**Dowding, HUGH CASWALL TREMENHEERE DOWDING, BARON** (b. 1882). British air force officer. Born April 24, 1882, he was educated at Winchester and the R.M.A., Woolwich, and commissioned in the Royal Artillery in 1900. Qualified as pilot in 1913, he joined the R.F.C. and commanded squadrons in the First Great War. He was later chief staff officer in Iraq, temporary A.O.C. in Transjordan and Palestine, and on his return to England was member of the Air Council for supply and research, 1930-1936.

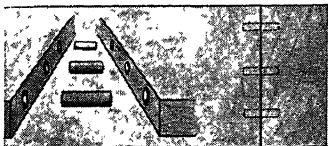


Lord Dowding,  
British air force  
officer

In 1936 Dowding became A.O.C. - in - C. Fighter Command, which controlled the fighter aircraft, the A.A. guns, searchlights, barrage balloons, and the Royal Observer Corps.

When in the R.F.C. he had developed radio communication between artillery batteries and aircraft, and this experience proved invaluable in building up the close cooperation between ground and air upon which anti-aircraft defence depended. The achievements of British fighters in the battle of Britain were partly due to his inspiring leadership of the brilliant organization he had built up in three years before the outbreak of war in 1939. Relinquishing his command in Nov., 1940, "Stuff" Dowding went to the U.S.A. for the ministry of Aircraft Production. Until he retired from the R.A.F. on July 15, 1942, he was reviewing aircraft establishments with a view to economy. He was knighted in 1933 and made a peer in 1943. His dispatch on the Battle of Britain was published 1946. He evinced much interest in spiritualism.

**Dowel.** Wooden, metal, or stone member used to unite two parts of a joint or to keep the parts



Dowel. Showing how dowels unite  
two parts of a joint

in proper position with relation to each other. Wood dowels, made from cylindrical hardwood, are widely used in door and window frames, chairs, etc., as an alternative to mortise-and-tenon joints, though they are not so strong. Two corresponding holes are bored in the members to be united; the dowels are glued and inserted into one of a pair of members, and the other member is then put in place and cramped up until the glue sets and hardens. Location dowels are used for cornices and ornamental members on bookcases; the dowel is glued into the loose member and fits into a dry, unglued hole in the fixed member.

Slate or iron dowels, rectangular in section, are used in masonry for mullions, transoms, coping stones, etc. They are cemented into registering holes in the two members. Besides helping to unite the stones, they hold them secure against sliding or other lateral movement. The posts of a doorframe used for an outer door are usually dowelled at the foot into the stone, concrete, or wooden threshold, the dowels being of iron. Dowels in engineering and machinery facilitate the correct positioning of members.

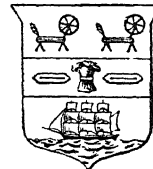
**Dower** (late Latin *dotarium*, gift). In English law, the amount allowed to a widow out of her husband's freeholds which he had not disposed of in his lifetime or by will. She was entitled to a life interest in one-third of these lands, set out by metes and bounds. Dower was abolished by the Administration of Estates Act, 1925.

**Dowie,** JOHN ALEXANDER (1847-1907). Scottish religious impostor. He was born May 25, 1847, at Edinburgh, and was for some years a Congregational minister in Australia, where he called himself the second Elijah, claimed power to heal diseases, and described himself as the First Apostle of Christ and the General Overseer of the Catholic Church. He went to America in 1888 and founded Zion City (*q.v.*), but in 1906 was deposed for embezzlement and polygamy. He died March 9, 1907.

**Dowlais.** Industrial town of Glamorganshire, Wales. It lies 2 m. N.E. of Merthyr Tydfil and has railway stations. There are ironworks, and the second occupation is coal-mining. Lighter industries have been introduced. Market day, Sat. Pop. 10,250.

**Dowland,** JOHN (1563-1626). British composer and lutenist. During his youth he travelled in Europe and was lutenist to Christian IV of Denmark, 1598-1606. He lived in England during his last years and from 1612 was lutenist to James I and Charles I. His first book of songs appeared in 1597; his third in 1603. In that year appeared his *Lachrymae* or Seven Teares, Figured in Seven Passionate Pavans. In 1612 he published his fourth and last book of songs, *A Pilgrimes Solace*. These four volumes (to lute accompaniment) rank among the finest songs ever written; as regards form and harmonic effect they are ageless. "Weep You No More, Sad Fountains," "Shall I Go Walk in the Woods so Wild?" "Now, O now, I Needs Must Part," are perfect of their kind.

**Down.** Eastern maritime county of Northern Ireland. It has a coast-line of nearly 70 m., excluding inlets. The principal indentations from N. to S. are Belfast Lough, Strangford Lough (studded with islets), Dundrum Bay, and Carlingford Lough; the chief rivers are



Down arms

the Lagan, Bann, and Newry. Mineral springs occur in several parts. Most of the surface is hilly, and in the S. the Mourne Mts. attain a height of 2,796 ft. (Sieve Donard). Much of the soil is cultivated for oats, wheat, potatoes, and flax; fisheries and horse-breeding engage many people, and linen and muslin manufactures, and cotton and flax spinning are leading industries. Traffic facilities through the co. are afforded by the Ulster Railways, The Northern Ireland Road Transport Board, and the Newry and Lagan canals. The principal towns are Downpatrick (county town), Bangor, Newtownards, Newry, Banbridge, Holywood, Donaghadee, Newcastle, and Warrenpoint. Two members are returned to the Imperial parliament and eight to the N. Ireland parliament. Area, 952 sq. m. Pop. 210,687.

**Downham Market.** Urban dist. and market town of Norfolk, England. It stands on the Ouse, 10½ m. by railway S. of King's Lynn. Dairy farming, nursery gardening, and brick-making are industries, and horse and cattle fairs are held. Market day, Fri. Pop. 2,463.

**Downing,** ARTHUR MATTHEW WELD (1850-1917). British astronomer. Born at Bagnalstown, co. Carlow, he was educated privately and at Trinity College, Dublin. In 1873 he was appointed assistant at the Royal Observatory, Greenwich, and was in 1890-91 secretary of the Royal Astronomical Society, becoming vice-president in 1893. In the same year he was elected president of the British Astronomical Association. His work on the Nautical Almanac, of which he was superintendent for a quarter of a century, was of great value, and when in Nov., 1899, the swarm of meteors known as the Leonids was expected to meet the earth, Downing published calculations showing that they would swerve sunward and miss this planet. He died Dec. 8, 1917.



**Downing College.** College of Cambridge University. Founded by a bequest of Sir George Downing, 3rd baronet, of Gamlingay, Cambridgeshire (c. 1684 - 1749), it received its charter in 1800. The buildings, designed by William Wilkins, date from 1807-73. New buildings designed by Sir Herbert Baker were put up in 1931. Ground between the college and Downing Street, once belonging to the society, had to be sold by the university. A small college, Downing has about 180 undergraduates.

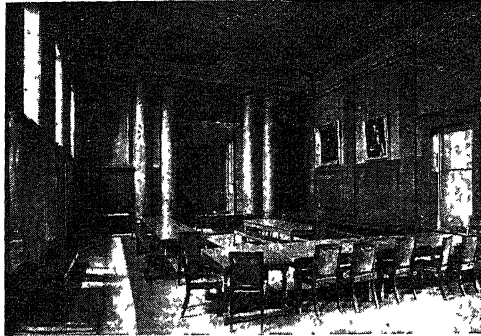


Downing College arms

**Downing Street.** London street famous as containing the official residence of the prime minister. A small turning out of Whitehall, it was built by and named after Sir George Downing, whose grand son founded Downing College. No. 10 is the official residence of the first lord of the Treasury, who is nearly always, though not necessarily, the prime minister. Sir Robert Walpole was the first premier to live here during his term of office, and all his successors have done so, save Melbourne, Peel, and Salisbury. No. 11 is the official residence of the chancellor of the exchequer, and No. 12 is the office of the Government whips. At No. 14 Wellington and Nelson met for the first and only time. On

the vicinity, and is the reputed burial place of St. Patrick. The seat of the diocese of Down, which was united with Connor in 1441, and Dromore in 1842, Downpatrick has an imposing cathedral, built of unhewn stone, and a number of holy wells. Muslin, leather, and soap are manufactured. Market days, Tues. and Sat. Pop. 3,147.

**Downs.** Ranges of chalk hills in S.E. England. They are usually



Downing College, Cambridge. Interior of the hall, designed by W. Wilkins

J. Palmer Clarke

divided into the Hampshire, Marlborough, North and South Downs. South of the line of the Kennet-Thames the chalk was uplifted to form a long ridge stretching as far as N.E. France. Subsequent erosion has worn away the top of the ridge, removed the chalk, greensand, and gault formations, and exposed the Weald clay. The lower slopes of the ridge still remain as the North and South Downs, sloping gently to the Thames valley and the English Channel respectively; both these lines of hills present steep scarps to the Weald, e.g. Leith Hill.

The rivers of the Weald have cut outlets through the Downs; in the N. the Wey, Mole, Medway, and

Stour, and in the S. the Arun, Adur, Ouse, and Cuckmere have made gaps between the chalk hills. In earlier days roads, such as the Pilgrim's Way followed the ridge to escape the marshes of the lowland, but the main development of traffic routes has been due to the influence of the capital, the roads focussing on London after passing through the gaps, as at Dorking,

Guildford, Maidstone, Newhaven, Arundel, and Shoreham.

The short turf provides pasture for innumerable sheep. The highest points do not reach 1,000 ft. in elevation.

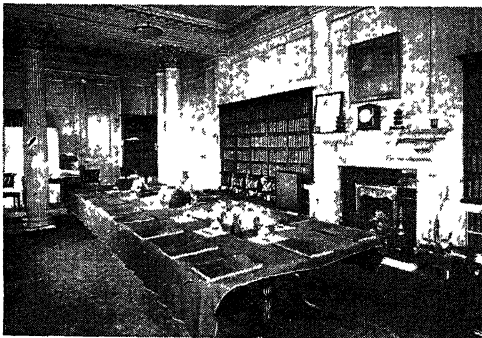
**Downs, THE.** Roadstead in the English Channel, between Deal, on the E. coast of Kent, and the Goodwin Sands. A secure anchorage for vessels, except during southerly gales, it has a length of

8 m., a width of 6 m., and a greatest depth of about 72 ft. In 1639 the Dutch fleet gained a signal victory over a Spanish squadron, and several engagements between the Dutch and English fleets took place here during the 17th cent.

**Downshire,** MARQUESS OF. Irish title borne since 1789 by the family of Hill. Trevor Hill, an

Irish landowner and an English M.P., was made Viscount Hillsborough in 1717. His son Wills, the 2nd viscount (d. 1793), was a politician of some note in the time of George III. During 1768-72 and again from 1779-82 he was secretary of state for the colonies. In 1751 he had been created earl of Hillsborough. He was made a British peer in 1772, and in 1789 marquess of Downshire. Arthur (b. 1894) became 7th marquess 1918. The family estates are at Easthampstead, Berks, and in co. Down.

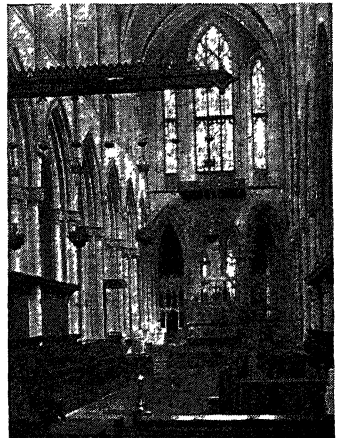
**Downside Abbey.** English Benedictine monastery and school. It is situated near Bath, and was



Downing Street, London. The Council Chamber at No. 10 arranged for a meeting of the British Cabinet

the opposite side of the street is the block of buildings devoted to the Foreign, Colonial, and Home Offices, built by Sir Gilbert Scott.

**Downpatrick.** County town of co. Down, Ireland. It stands near the S.W. end of Strangford Lough, about 27 m. S.E. of Belfast, and has a railway station. Downpatrick derives its name from a great mound called a "dun" in



Downside Abbey, near Bath. View of choir. Downside was raised from a priory to an abbey in 1899

established in 1814. The community was founded at Douai in 1605, and from the first has been engaged in the education of English boys. It was broken up at the French Revolution, and in 1795 the monks moved to England and maintained their school in Shropshire. The present buildings were begun in 1823; in 1899 Downside was raised from a priory to an abbey, and it is now one of the most notable modern Gothic buildings in Great Britain. Cardinal Gasquet was a headmaster.

**Dowser or Water Diviner.** One who claims that he can locate water—and in earlier days metals, oils, etc.—beneath the surface of the ground, with the aid of some form of divining rod (*q.v.*).

**Dowson, ERNEST CHRISTOPHER** (1867–1900). British poet. He was born Aug. 2, 1867, and as a youth spent much of his time in France. A lyrist of great delicacy, he has a permanent place in English anthology. One of his best known poems has the refrain, "I have been faithful to thee, Cynara, in my fashion." He wrote in collaboration with Arthur Moore two novels, *A Comedy of Masks*, 1893, and *Adrian Rome*, 1899. Dowson, whose collected poems were published in 1900, died Feb. 23 that same year.

**Doxology** (Gr. *doxologia*, a praising). Hymn of praise to God. Its basis may be found in certain passages in the N.T., notably in Rom. 16 and Eph. 3. The term is specially applied to the Lesser Doxology, the Gloria Patri, Glory be to the Father, and to the Son, and to the Holy Ghost, sung at the end of each psalm and canticle, except the Te Deum, in the daily service of the Church of England, and of the Roman Catholic Church. Its use dates from the 4th century.

The Greater Doxology is the hymn Gloria in Excelsis Deo at the Eucharist, which also dates from the 4th century.

The last verse of Bishop Ken's evening hymn, beginning Praise God from Whom all blessings flow, is popularly known as the doxology in English-speaking countries.

**Doyle, SIR ARTHUR CONAN** (1859–1930). British novelist. He was born at Edinburgh, May 22, 1859, was the son of one artist, Charles Doyle, the nephew of another, Richard Doyle (*q.v.*), and grandson of a third John Doyle (*q.v.*). He was educated at Stonyhurst, in Germany, and at Edinburgh university, where he studied medicine and graduated M.B. He was in medical practice, 1882–90,

at Southsea and in London, but the success of his early work in fiction caused him to devote himself to literature.

By 1891 Doyle had already produced some notable novels, including the first two Sherlock Holmes stories, *A Study in Scarlet*, 1887, and *The Sign of Four*, 1890; also *Micah Clarke*, 1889, a story of the Monmouth rebellion, and *The White Company*, 1891, one of the finest of all historical novels. With *The Adventures of Sherlock Holmes*, 1892, a collection of short stories first published serially in *The Strand Magazine*, Doyle leapt to the widest popularity; and this book was followed at intervals throughout his life by further stories, long and short, of the same acute master of deduction, even after his creator, on his own confession, had tired of him. (*See Holmes, Sherlock.*)

Further memorable works with historical backgrounds are *The Great Shadow*, 1892; *The Exploits of Brigadier Gerard*, 1896; *Rodney Stone*, 1896; *The Adventures of Gerard*, 1903; and *Sir Nigel*, 1906, a story linked with *The White Company*. Stories of contemporary life include *Round the Red Lamp*, 1894; and *The Tragedy of the Korosko*, 1898. *The Lost World*, 1912, and *The Poison Belt*, 1913, take readers into the realm of scientific fantasy in the company of another striking creation, Professor Challenger. *Through the Magic Door*, 1908, is a series of pleasing essays on books. His occasional dramatic writings include the one-act play, *A Story of Waterloo*, 1894, which provided Irving with a fine character part; *The House of Temperley*, based on Rodney Stone (Adelphi Theatre, 1909), and *The Fires of Fate*, a "modern morality play" (Lyric Theatre, 1909). He also wrote numerous pamphlets and books on public affairs, interesting himself particularly in the case of Oscar Slater (*q.v.*).

In the S. African war, Doyle went out as physician with a field hospital. His history, *The Great Boer War*, was a popular, readable narrative. Of his pamphlet putting Britain's case before the peoples of Europe, 100,000 were distributed; it was printed in twelve languages. He was knighted 1902.



Sir A. Conan Doyle,  
British novelist

His chief activity during the First Great War was the production in six serial volumes of a *History of the British Campaigns in France and Flanders*, completed 1920 and rewritten in more concise form in 1928. It was during this war that his great interest in spiritualism first became generally evident. He was subsequently a recognized leader of the movement, writing and speaking continually on psychic matters and producing a *History of Spiritualism* in 1926.

Active, transparently honest and forthright, a keen lover of sport, and an ardent patriot, Doyle was a writer who always approached his craft in a robust, masculine way, employing a simple but vigorous objective narrative style and revealing a shrewd grasp of human character and motives. He died July 7, 1930. *Consult* C. D., his *Life and Art*, H. Pearson, 1943; *The Real C. D.*, Adrian Conan Doyle, 1945.

**Doyle, JOHN** (1797–1868). British painter and caricaturist. He was born at Dublin, entered the Dublin Society's drawing school, and began a career as a portrait painter while still a boy. Six plates of *The Life of a Racehorse* were his first publication in London, whither he went in 1821. In 1829 he began the long series of political caricatures signed "H. B.," which occupied 22 years. These drawings, many now in the British Museum, are character studies rather than caricatures, and generally excellent likenesses. The original sketch for the large engraving by Walker and Reynolds (1836) of the Reform Bill receiving the king's assent by royal commission, 1832, was Doyle's work. The last years of his life were passed in retirement, and he died Jan. 2, 1868.

**Doyle, LYNN.** Pen-name of Leslie A. Montgomery (b. 1873). Northern Irish humorous novelist and playwright. Born at Downpatrick, he was the first to recapture in fiction the somewhat craggy humour of the Ulster Scot, and his first book of short stories, *Ballygullion*, 1908, was a landmark in Ulster literature. A life-long association with banking—as clerk and manager in country branches—provided him with a background for his work on small-town life. A play, *Love and Land*, was successfully produced in London in 1926 under the title *Persevering Pat*. In spite of a large output of stories, novels, plays, and light verse, he may be

best remembered by An Ulster Childhood, 1921, a charming book of autobiographical sketches of an Ulster that long ago disappeared.

**Doyle, RICHARD** (1824-83). British painter and caricaturist. He was born in London, Sept. 18,



*Doyle*

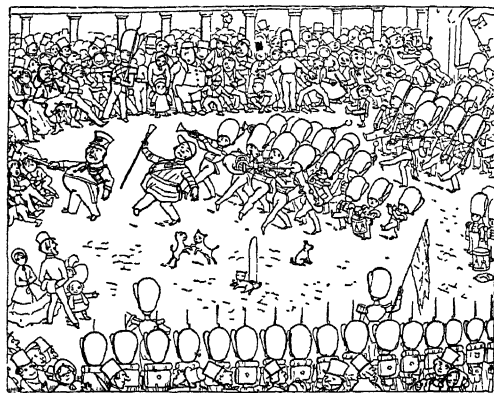
1824, second son of John Doyle, and studied under his father. In 1843 he became a regular contributor to *Punch*; in 1849 he produced the cover which it has retained ever since. He resigned from

*Punch* in 1850 in consequence of its attacks upon the pope and Cardinal Wiseman, Doyle himself being a Roman Catholic. Then he confined himself to book illustration, dying at the Athenaeum Club, from apoplexy, Dec. 10, 1883. The kindly humour of his satire displayed itself in illustrations to Thackeray, Leigh Hunt, Mark Lemon's *Fairy Tales*, etc.

**D'Oyly Carte Opera Company.** Founded in 1875 by Richard D'Oyly Carte (*q.v.*). It was the result of a successful performance of *Trial by Jury*, the first Gilbert and Sullivan opera to be commissioned by Carte. A syndicate was formed to produce Gilbert and Sullivan operas at the Opéra-Comique, London, but, following dissensions, Carte built his own theatre, the Savoy, 1881, which was the home of these operas for some 10 years. The company from then owned the copyright of all Gilbert and Sullivan operas. Rupert D'Oyly Carte (1876-1948), son of Richard, took control in 1901, his daughter Bridget in 1947. It was reformed, 1949, as a private co., with Bridget as managing director. See Gilbert and Sullivan.

**Drachenfels** (Ger., dragon's rock). German mt. by the Rhine. It is 8 m. S.E. of Bonn and 1,065 ft. high. At the summit, which can be reached by means of a rack and pinion rly. from Königs-winter (*q.v.*), are the ruins of a castle erected by Arnold, archbishop of Cologne, early in the 13th century. The mt. is famous in legend

as the site of the cavern in which lived the dragon that Siegfried slew. The wine that is produced



Doyle. Mounting the guard at St. James's Palace in 1849; characteristic humorous drawing by Richard Doyle

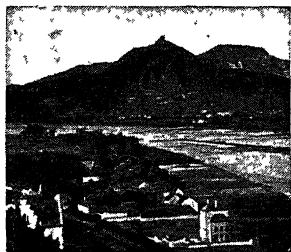
here is still known as *Drachenblut*. The castle was destroyed during the Thirty Years' War. The magnificent views from its summit are immortalised in Byron's *Childe Harold's Pilgrimage*. The cathedral at Cologne was built largely of stone obtained from this mt. On the wooded slope is the Gothic Schloss Drachenburg, built in 1883. The fall of the *Drachenfels* to the Allies in the Second Great War was announced by the Germans March 16, 1945.

**Drachma.** Greek silver coin, roughly equivalent to the franc. The unit of account, it equals 100 *lepta* and is coined in 10, 20,



Drachma. Silver drachma, slightly reduced, of Alexander the Great

and 50 *lepta*, 1 and 2 *drachma* pieces in nickel. Since 1940 there have been gold pieces of 20 and 100 *drachmas*. *Drachmas* and *lepta* are used also in the currency of Crete. Originally the *drachma*—a “handful”—was a weight; also the chief silver coin of the ancient Greeks; its modern value in different parts of Greece varied from about 1s. 2d. to 10d. See also *Dram*.



Drachenfels. The castle-crested mountain from across the Rhine

**Drachmann, HOLGER HENRIK HERHOLDT** (1846-1908). Danish author, born Oct. 9, 1846, at

Copenhagen. He had been for some years a student at the academy of arts at Copenhagen when, encouraged by Georg Brandes, he determined to devote himself to literature. A man of extremely impressionable temperament, his songs and lyrics express different moods and attitudes towards life. His first volume of

poems, 1872, was full of youthful rebellion against existing conventions; later his views grew more placid. He wrote novels and plays, but is chiefly remembered as introducing the modern short story into Denmark. His tales of fisherfolk are remarkable for their realism. He died at Copenhagen, Jan. 14, 1908.

**Draco** or **FLYING DRAGON**. Genus of so-called flying lizards, of which there are about twenty species, all found in India and Malaysia. All small, they are remarkable for the length of the hind ribs, which stretch out the skin and form a pair of wing-like expansions. These ribs can be folded back, somewhat like a closed fan. The lizards live in the trees, and, aided by their “wings,” take long flying leaps.

**Draco.** A long, winding stream of stars between *Ursa Major* and *Ursa Minor*, and almost encircling the Lesser Bear. According to E. W. Maunder, *Draco* the Dragon (Ptolemaic) is one of the most ancient of all constellations (*q.v.*). Alpha *Draconis* or *Thuban* was the original Pole Star when the constellations were mapped out.

**Draco** (*fl.c.* 620 B.C.). Archon or magistrate of Athens, the first to codify and commit to writing (*c.* 621 B.C.) the laws of the state as formulated in the decisions of its judges. The severity of this code has made the word “draconian” a synonym for unmerciful, but the Draconian code was no more severe than other early codes of law. Its severity was mitigated by Solon, selected archon in 594.

**Dracula.** Fictitious supernatural being, chief figure in an horrific story of the same name

written by Bram Stoker in 1897. A development of the legendary werewolf, with power to change shape at will, the creature assumed human form as Count Dracula, existing on the blood of human beings until they died, whereupon their spirits also were cursed with the same horrible attributes and the same diabolical ingenuity in pursuing their victims and eluding capture. In the story Dracula leaves his Balkan castle in order to practise his black arts in England, notably in London and Whitby. This sensational book had a wide popular success; a stage adaptation was first presented at the Little Theatre in 1927, and a film version appeared in 1931.

**Draft.** In commerce, a term used for an order requesting a bank or person who holds money for another to pay a certain sum to a certain person. It is more elaborate than a cheque, and is a fuller protection against misuse. The word is also used for a rough sketch or a first copy of a business or other document. *See* Banking.

**Draga** (d. 1903). Queen consort of Serbia. As Draga Mashius she was maid-in-waiting to the Serbian queen, Natalie. In July, 1900, she married King Alexander I, and July 11, 1903, she and her husband were murdered at Belgrade by the supporters of the Karageorgevitchs.

**Drag Hunt.** A form of hunting in which there is no quarry, but the hounds follow a trail previously laid by dragging a strongly-scented article or substance along the ground. This kind of hunt meets all the objections of animal lovers to the killing by hounds of foxes, stags, etc.

**Dragon.** Fabulous monster common to the folk-lore of most nations. It is generally in the form of a gigantic reptile with four legs and a fierce (often fire-breathing) head, and frequently furnished with wings. It is the form often taken by the monster overcome by the hero of folk-tales and legends of many lands. In Christian art the dragon has long been accepted as typifying sin. In China, the dragon is the honoured symbol of nature and of man as creator.

**Dragon.** In military use, name applied to a mechanical tractor used for drawing guns, propelled by an internal combustion engine and running on caterpillar tracks. Formerly the name was given to a short musket, orna-

mented with a dragon's head, from which the dragons derived their name.

**Dragon.** In British heraldry, a monster having a lion-like scaly body, bat-like wings, barbed tail and tongue, and pricked up, pointed ears. It is one of the national badges of Wales. The Continental dragon usually has only two legs, and is of the wyvern (*q.v.*) type. The old Imperial Chinese golden dragon, generally shown as protecting the sun with long feelers projecting from its jaws, had five claws to each foot. Dragons for princes and lesser lights were of different colours and had fewer claws. The Japanese Imperial dragon has only three claws to each foot.

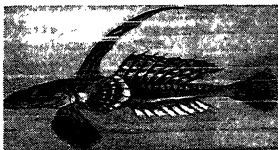
Dragon in heraldry



**Dragon** (*Dracunculus vulgaris*). Perennial herb of the family Araceae. A native of S. Europe, it is similar to the cuckoo-pint, but differs in its taller stem (spotted with purple), its divided leaves, and the more open spathe. The flowers give off an offensive odour.

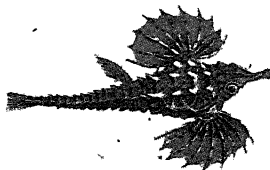
**Dragon Boats, FESTIVAL OF THE.** Chinese annual regatta. It is held on the fifth day of the fifth moon, approximately corresponding to June 18. It is said to have originated in the suicide of a statesman, Wat Yuen, who was degraded and dismissed by his prince because of his interest in the people. The river into which he threw himself was quickly covered by boats filled with people searching for his body, and each year afterwards crowds went again to the place, throwing offerings of rice into the river.

**Dragonet** (*Callionymus*). Group of brilliantly coloured fish, related to the gobies. There are about forty species, one found



Dragonet, *Callionymus lyra*

in deep water off the British coasts. The fore part of the body is flattened, and the pectoral and dorsal fins are large and conspicuously spined. The females are dull in colour.



Dragon Fish. *Pegasus volans*, small and curious exotic fish

**Dragon Fish** (*Pegasus*). Genus of small fish found around India, China, and Australia. The broad, flattened body is completely covered with small bony plates instead of scales, and the gill cover consists of only one plate. The fish has no teeth and no swim-bladder.

**Dragon Fly** (*Odonata*). Order of insects with net-veined wings. There are about 2,000 known species, of which 43 kinds occur in Great Britain. They are handsome insects, with large heads, conspicuous compound eyes, short antennae, and powerful jaws. The thorax is thick, and in most species the abdomen is long and slender. The four wings are long, transparent, and beautifully veined. Many species are brilliantly coloured.

The earlier stages of the dragon fly's life are passed in the water. The larva is provided with a mask, or jaw appendage, which can be thrust forward to seize its prey, which consists of almost any small aquatic creature within reach. The larva breathes by means of gills placed at the hinder extremity of the abdomen. There is no distinct resting or pupal stage, but after about a year or more in the water the nymph crawls up the stem of a plant, or on the bank of the pond, where presently the skin cracks open down the back and the perfect insect emerges. *See* Insect.

**Dragonnades.** Name given to the persecution of the Huguenots in France just before and after the revocation of the edict of Nantes in 1685. It is so called because dragons enforced the king's orders against the Protestants.



Dragon Fly. Specimen of *Aeschna cyanea*. Upper picture, demoiselle dragon fly, *Calopteryx virgo*

**Dragon's Blood.** Red resinous exudation from the fruits of a number of palms. Dragon's blood is obtained from some species of *Daemonorops*, the varieties East Indian, Malay, Sumatra, and Borneo being from different kinds of *Daemonorops*. It was formerly used as an astringent in medicine and as a component of love philtres, and is still employed as a colouring matter for varnishes.

**Dragon Tree** (*Dracaena draco*). Tree of the family Liliaceae. A native of the Canary Islands, it



Dragon Tree. A very old specimen of the tree growing in Tenerife

has long, slender, lance-shaped leaves in a crowded head at the summit of the stem, giving it a palm-like aspect. The tree's small, greenish-white, bell-shaped flowers are produced in a large panicle. When of great age, the trunk branches above. There was a great tree of this species at Orotava in Tenerife which was world-famous, for it was believed to have an antiquity greater than that of the Pyramids. In 1402 the trunk had a circumference of 42 ft.; four centuries later Humboldt found that it had increased to 48 ft. In 1827 a great storm subjected it to much injury, and in 1851 it was destroyed. Its age had been estimated at 8,000-10,000 years.

**Dragoons.** Originally mounted infantry trained and organized to fight on foot, using horses only for moving into action. Established in nearly all European armies in the 17th century, dragoons took their name from the dragon, or short musket, with which they were armed. By the end of the 18th century they had developed into cavalry proper.

In the British army there were originally three regiments of dragoons and seven of dragoon guards. The 1st or Royal Dragoons was formed in 1661; the 2nd, or Scots Greys, raised in 1678; and the 6th, or Inniskilling Dragoons, in 1685. Dragoon guards were

the 1st, or King's, raised in 1661; the 2nd, Queen's Bays, the 3rd, Prince of Wales's, the 4th, Royal Irish, the 5th, Royal Inniskilling Dragoon Guards, the 6th, Carabiniers, and the 7th, Princess Royal's, all raised in 1685. The Royal Dragoons were present at Sedgemoor and took up the pursuit of Monmouth's defeated troops. Dragoon regiments earned distinction under Marlborough in Flanders, where they were employed for the first time in a purely cavalry rôle. The Scots Greys, Inniskilling Dragoons, and Queen's Bays formed the famous Union Brigade at Waterloo, capturing a French eagle, a replica of which now forms the regiment's badge. The Heavy Brigade at Balaklava was made up of the 1st, 2nd, and 5th Dragoons.

On the reduction of British cavalry in 1922, the 3rd and 6th Dragoon Guards were amalgamated as the 3rd-6th Carabiniers, and the 4th Royal Irish and 7th Princess Royal's became the 4th-7th Dragoon Guards. Shortly before the Second Great War all Dragoon regiments had been mechanised, the Queen's Bays and the Scots Greys being the last to be converted. Dragoons now form part of the Royal Armoured Corps, though they continue to wear distinctive badges. Mechanised dragoons served in all theatres of the Second Great War, earning particular distinction in N. Africa.

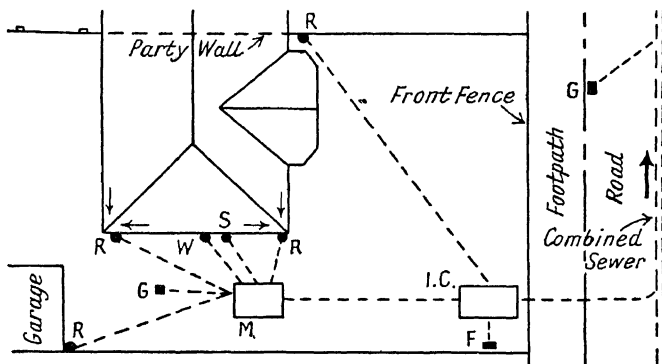
**Draguignan.** Town of southern France, capital of the dept. of Var. It is in a valley by the river Nartuby, an affluent of the Argens,

41 m. N.E. of Toulon, with which it has rly. connexion. It possesses a handsome modern palace of the prefecture, court house, museum, hospital, botanical and zoological gardens. The varied industries of Draguignan include the manufacture of silks, woollens, hosiery, leather articles, brandy, oil, and earthenware. It was founded in the 6th century. Pop. 11,801.

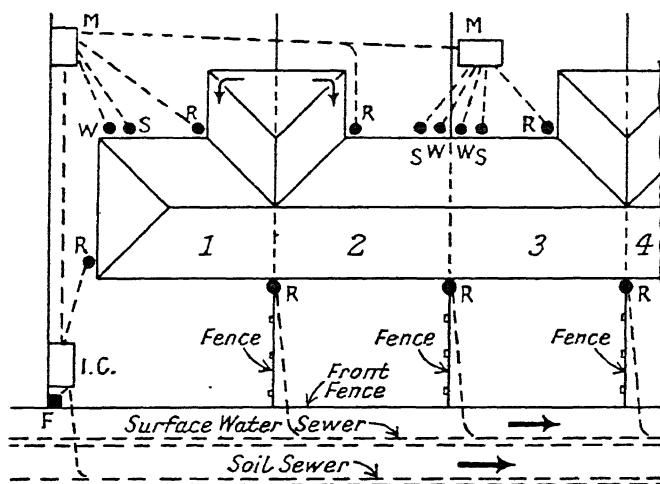
**Drainage.** Term for the removal of water from places in which its presence is harmful to places in which it is harmless.

**LAND OR AGRICULTURAL DRAINAGE.** A few plants thrive well in waterlogged soil. All others, including most of the food-producing plants, require free circulation of air, with sufficient but not excessive moisture, in the soil in which they are rooted. Below a certain depth, varying according to circumstances, the soil is saturated. The surface of saturation is known as the water table. Most plants thrive best when their roots approach but do not reach the water table. Drainage aims at maintaining the water table at or slightly below the level most suited to the plants to be grown, so that their roots will not be waterlogged for more than a few hours even after heavy rain, and yet will be able to absorb the plant food they require, dissolved in moisture drawn up by the capillary action of the soil from the natural reservoir below the water table. It can do almost as much harm to depress the water table too low as to allow it to rise too high.

The limit to which the water table can be lowered by gravity without pumping is determined by the bed levels of the neighbouring streams, rivers, or watercourses. The optimum bed levels for these, having regard to the whole course



Drainage. Semi-detached house drained on combined system, i.e., with all waste water drained to one (soil) sewer. F, fresh air inlet; G, gully; I.C., intercepting chamber; M, manhole; R, rainwater pipe; S, soil pipe; W, waste pipe



Drainage. Terrace houses drained on partially separate system. For explanation of lettering see diagram at foot of facing page

of river, stream or watercourse, should be decided by an engineer with the special training necessary for this highly technical calculation. When the beds have been set to the optimum levels they should be maintained thereat by periodical clearance of silt and vegetation, or, if they have been scoured too low, by refilling. The regulation of the level of the water table in the fields is done by laying a system of main and branch pipes leading from the upper to the lower parts of the fields.

The smallest drains practicable are 2-in. earthenware pipes. These are laid  $2\frac{1}{2}$  ft. to 3 ft. deep, unjointed so that water can seep in, 15 ft. to 20 ft. apart, according to the slope of the ground and the nature of the soil, following the general slope of the ground, starting from the highest points. If the ground is ridge and furrow, the pipes are laid below the furrows. Where two 2-in. drains come together, or the length of one is such that it will collect water beyond its carrying capacity, 3-in. pipes are used. The junction is stream-lined through Y pipes. As obstructions are more likely to occur at junctions than elsewhere, it is best, if levels permit, to lay the large pipe some 3 ins. below the incoming 2-in. pipes. The 3-in. pipes are in turn collected into 4-in. pipes. The 4-in. pipes are often termed main drains, and the smaller sizes branch drains. A 3-in. pipe discharges  $2\frac{1}{4}$  times as much as a 2-in., and a 4-in.  $1\frac{1}{2}$  times as much as a 3-in. A normal 4-in. drain with its branches will drain from 5 to 10 acres, the size of the area depend-

ing on the nature of the soil and the slope of the ground.

The final outfall must be protected by a grating against the entry of rats or other vermin, except when the drain discharges below high tide level in an estuary or on the sea shore, when a flap valve or sluice valve must be provided to prevent the tide from flowing up the drain.

In alluvial flats where ground level is little if at all above high water mark, the water table can be lowered only by pumping. Wind operated pumps are cheapest, but are unreliable. If cheap electric power is available the most convenient pumps for this

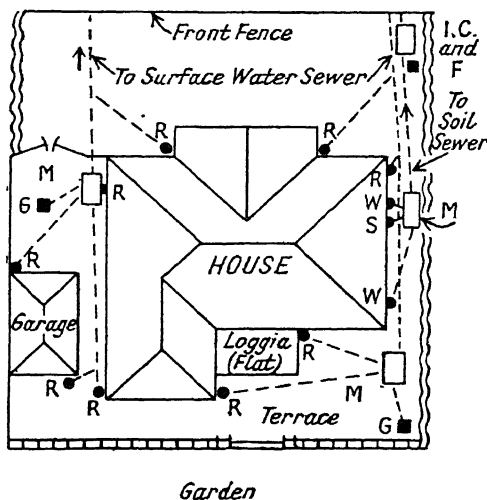
purpose are vertical, spindle-float-controlled, motor-driven pumps. They can be so arranged that the pump is always primed while the motor is above any possible rise of water level. Lands reclaimed by embankments from the sea must be constantly drained by pumping.

**HOUSE DRAINAGE.** The drainage of houses is usually divided into two systems (a) for the removal of rain water, (b) for the removal of dirty water, from baths, wash basins, and sinks, and of sewage from W.C.s.

(a) *Rain water* is collected in gutters as it runs off the roofs, and led down by open-top pipes, usually 3 ins. in diameter, to ground level. There it is taken underground through gully traps, in towns into the public sewer; in the country into rain water sewers usually 4 ins. in diameter and to a convenient stream or ditch, or to a soakaway, which is a pit, perhaps filled with loose ballast, from which the water will find its way into the surrounding ground.

(b) *Dirty water and sewage.* Dirty water and sewage are led by pipes to the house sewer. The details of the system are regulated by local authority by-laws. Where a public sewerage system (often known as main-drainage) exists, the house sewage discharges into the nearest public sewer. Where there is none, the house sewer must lead to some form of sewage disposal work. House drainage is explained in the diagrams.

**TOWN DRAINAGE.** Town drainage is the removal of unwanted water from within to outside municipal limits, by open ditches or underground sewers. In England and many temperate climates of moderate and evenly spaced rainfall, it is usual to take rain and waste water in the same sewers. In countries subject to extremely heavy rainfall such as occur during the monsoons, most towns remove rain water in open drains on the surface, and foul water in sewers. In hilly ground the whole removal can be done by gravity without necessity for pumping. In flat



Drainage. Detached house drained on wholly separate system. For explanation of lettering see diagram at foot of facing page



country pumping is usually necessary. The final discharge from the sewers may be into the sea, when precautions must be taken to protect the shore from fouling. This is a cheap method, but it is wasteful of organic matter which ought to be restored to the land, a subject to which more attention is being devoted. In a few places inland, sewage effluent is still allowed to fall unpurified into rivers, if this was already being done in 1876; but this ought to be stopped, harmless waste only being discharged after the sewage has been purified in purification works. Each town presents an individual problem which must be dealt with by an engineer trained in this highly technical subject. See Cesspool; Plumbing; Sewerage.

F. C. Temple, M.Inst.C.E.B.

**Drake, Sir Francis** (c. 1545-96). English seaman. His origins are obscure, but Drake was born probably at Crowndale, near Tavistock. The year is given by some old writers as 1545, by others as 1539. He is believed to have served an apprenticeship on a small coasting vessel, and then to have made a voyage to Guinea and the Spanish Main. In command of the 50-ton craft *Judith*, he sailed with his cousin, John Hawkins, on the trading expedition which barely escaped destruction by the Spaniards at San Juan d'Ulloa, in 1567. The treachery of the Spanish authorities on this occasion fixed in the mind of Drake a determination to wage war upon them as the enemies of his country and his faith. After two voyages of investigation he sailed in 1572, with a small but picked force, sacked Nombre de Dios, crossed the Isthmus of Panama until he came in sight of the Pacific, uttered his characteristic prayer that "Almighty God would grant him life and leave to sail an English ship upon that sea," captured a great Spanish mule-train of treasure, and returned home.

On Nov. 15, 1577, he started on a still more audacious venture—the circumnavigation of the world—with five ships; made his way through the Strait of Magellan (Aug., 1578), discovered that Tierra del Fuego was not a continent, but an island, and then with the one ship that remained to him, the *Pelican* or *Golden Hind*, proceeded to attack one after another the Spanish ports on the Pacific, where no hostile ship had before been seen. After capturing and clearing a great treasure ship, the *Cacafuego*, he sailed to seek a



Sir Francis Drake, English sailor  
From a contemporary portrait

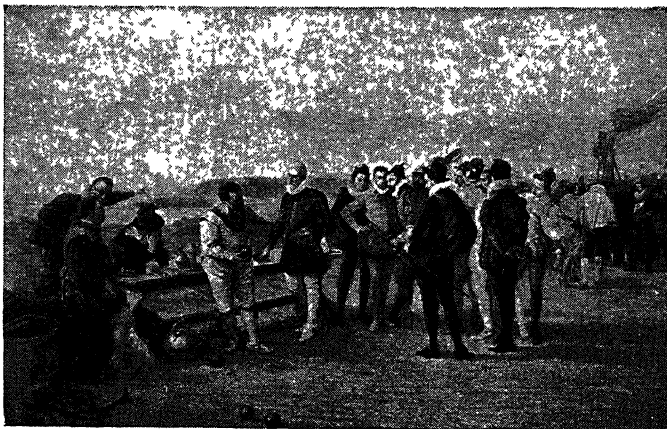
north-east passage. Incidentally he landed in California, where he won from the natives such golden opinions that they proposed to deify him. Failing to find the north-east passage, he sailed across the Pacific to the Spice Islands, passed the Cape of Good Hope in Jan., 1580, and sailed into Plymouth Sound on Sept. 26, bringing vast treasure, which was duly shared by Elizabeth. The Spaniards demanded his punishment as a pirate; the queen knighted him instead. He was the first captain who had in person sailed completely round the globe, and he had taught English mariners their immense superiority over the Spaniards.

In 1585, when the official declaration of war with Spain was imminent, Drake put to sea unofficially with a considerable flotilla, sailed into the port of Vigo, which was put to ransom, crossed the Atlantic to the Spanish Main, fell upon San Domingo and Car-

tagena, which were also put to ransom, captured a great treasure ship, and returned triumphantly to England. In 1587 he commanded the expedition which sailed to Cadiz, burnt the shipping, and postponed the sailing of the Armada for 12 months. In 1588, during the months when the British fleet first awaited and then shattered the Armada, Drake was its inspiring and guiding spirit, though nominally only second in command, his flagship being the famous "little Revenge."

In 1589 Drake was associated with Sir John Norreys in the command of a joint naval and military expedition to Lisbon. It failed of its purpose, not by Drake's fault, and the great seaman was practically shelved. In fact, he wished to destroy the Spanish power utterly, while the queen sought only to humble and despoil Spain, and the failure at Lisbon was used to discredit him and his policy. In Aug., 1595, however, he sailed once more with Hawkins to the West Indies. The cousins were not on the best of terms; the Spaniards were well prepared and on the watch, and the expedition accomplished little. Hawkins died; some weeks later, near the town of Nombre de Dios, on Jan. 28, 1596, Drake himself fell a victim to dysentery, and his body was committed to the Atlantic Ocean, the fitting grave for the mighty seaman.

Drake, more than any other single man, was the founder of England's naval supremacy, the incarnation of the Elizabethan spirit of maritime adventure and resourcefulness, which was only a shade less brilliantly exemplified in Hawkins, Frobisher, Davis, and other captains. It was Drake



Drake continues a game of bowls undaunted by news of the approaching Armada. Scene depicted by Seymour Lucas, R.A., in his painting *The Armada in Sight*

who, as second in command and real director of the operations against the Armada, established the decisive principle of naval warfare that victory is the reward of mobility, seamanship, and gunnery; and who, whenever he could get his own way, applied the master rule of seeking out the enemy fleets and carrying out a strategic offensive in preference to the purely defensive methods, the protection of coasts and home waters, for which landmen, and the politicians dominated by landmen, are always apt to clamour under threat of invasion.

Drake's statue stands on Plymouth Hoe, where he played the famous game of bowls before beating the Armada. His name was given to a former parl. div. of that city. See Armada.

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**Drakensberg** OR QUATHLAMBA. Range of mountains in S. Africa, between Cape Province, Basutoland, Orange Free State, and Natal. They form a rampart extending from Griqualand East to Mont aux Sources, the highest peak, 11,000 ft., and thence N.E. to Majuba Hill, 7,000 ft. Another range crosses N.E. Transvaal towards Swaziland. The erosion of the volcanic lavas has produced remarkable escarpments, as at Maclear, Cape Province, and at Mt. Anderson, the highest in the Transvaal Drakensberg, 7,490 ft. The Drakensberg national park is one of the scenic treasures of the S. African Union.

**Drake Strait.** Wide channel between Tierra del Fuego and Graham Land, Antarctica. It connects the Atlantic with the Pacific, and, though well N. of the Antarctic Circle, is encroached on by drift ice.

**Dram** OR DRACHM. Unit of weight, being one-sixteenth of an ounce avoirdupois. Before 1864 it formed also the eighth part of 1 oz., apothecaries' weight. The name comes from drachma, and is still used in the Levant, 400 drams making one oke, 44 okes equalling one cantar or kintal or 125 lb. avoirdupois. The term, transformed into dirhem, was used in Arabia for both a weight and a coin. See Pound.

## THE DRAMA: ITS EVOLUTION AS AN ART

S. R. Littlewood, Editor of *The Stage*

*The long history and wide appeal of the drama is here outlined. Cognate articles are those on Comedy; Tragedy; Stage; Theatre. See also the biographies of the great playwrights, ancient and modern, e.g. Sophocles, Shakespeare, and Shaw, and the great actors, Garrick, Kean, Irving, Tree, and others*

Drama (Gr. *dran*, to do) is the art of expression by action. As the verb is to the other parts of speech so is drama in its relation to the other arts. It employs almost all of them, and depends upon them to complete its purpose, abstract action being inconceivable. All the conventions and so-called rules around which controversy has raged spring from this primal fact, and are binding only in so far as they are inevitable. Action itself, for instance, demands that there should be a subject and an object; and reflex action, without which dramatic development is impossible, demands at least two participants.

There must be, as Aristotle said in his *Poetic*, a beginning, a middle, and an end. This at once distinguishes drama from the life of the world, and makes the need for unity of action obvious. Drama need not in theory be imitative or confined to imitation. If Macbeth and Macduff fight in earnest—as they did on one occasion when played by Macready and Phelps—the result may be no less drama. Reality, however, is in the main technically needless and inexpedient, and the human mind has shown itself incapable, as yet, of presenting an idea that is not imitative—at any rate, in its parts.

The beginnings of drama are to be found in the instinctive pretences, for the mere sake of expression, common to all savage races and many animals. Probably long before the arrival of speech tragedy had taken a set form in the war-dance and comedy in phallic revels, both afterwards merged in the ritual of primitive religions.

**THE GREEK DRAMA.** Historically, the all-important Greek drama is presumed to have developed from the dithyrambs or hymns in honour of Dionysus, god of wild vegetation, fruits, and especially the vine, sung by a chorus dressed as satyrs, who engaged also in mimic dance-stories. A later theory put forward by Prof. Ridgeway is that Greek tragedy sprang from the worship of the dead; but it has not reached large acceptance, and the derivation of the word tragedy—a "goat-song"—suggests the

other view. Arion, of Methymna in Lesbos, who worked with Dorians at Corinth, first composed verses to be spoken by a chorus-leader, mounted upon the sacrificial table in the intervals between the songs. In this way the altar itself was the first stage.

Thespis (c. 535 B.C.), of Icaria, in Attica—who is reputed to have gone from place to place with a company of players on wagons, their faces smeared with wine- lees—introduced a masked actor to engage in dialogue with the chorus-leader. With the amazing speed and curious finality that has characterised nearly all dramatic developments, the theatre of Athens was to produce, in a little over a century, the tragic masterpieces of Aeschylus (525–456 B.C.), who introduced a second actor and made the dialogue the main part of the tragedy; of Sophocles (495–406 B.C.), who introduced a third actor and possible a fourth; and of Euripides (480–406 B.C.).

**Athenian Writers of Comedy**  
Contemporary with Euripides, whom he mercilessly satirised, was the great master of the so-called Old Comedy, Aristophanes (448–380 B.C.), followed by 37 forgotten writers of the Middle Comedy. After the conquest of Greece by Philip of Macedon flourished Philemon (c. 330 B.C.), Menander (342–290 B.C.), his contemporary Diphilus, and others representing the New Comedy. All the works of Menander, and all but fragments of other New Comedy writers, are lost, but they still live in the plots of the great Roman comic dramatists, Plautus (c. 251–184 B.C.) and Terence (195–159 B.C.), the latter born at Carthage. Six of Terence's adaptations from Menander remain, though he is said to have adapted 108 more, and to have died of grief on hearing they were lost at sea.

Of the greatness of the Athenian drama, both on its tragic and comic sides, and the incalculable debt owed to it by all subsequent European dramatic art, the general explanation appears to have lain in the blending of religious ceremony with intense civic consciousness under the popular impulse of a great national (and for a time) triumphant struggle. Much

the same thing was to be said nearly 2,000 years after of our own Elizabethan drama. The religious solemnity, strong in Aeschylus, was modified by a more humane grace in Sophocles, and still more so in Euripides, who was to become—through his Roman imitator, Seneca (c. 4 B.C.—A.D. 65)—the father of romantic drama in Europe.

The intense national feeling, however, out of which the Greek drama grew remained to inspire the Athenian theatre from Aeschylus's *Persae* (472 B.C.), written to celebrate the victory over the Persians at Salamis, to Euripides' flight into Macedonia (408 B.C.). The vast open-air theatre of Dionysus at Athens held more than 30,000 spectators, roughly a sixth of the Athenian population, and more than the entire number of free citizens. To be able in any way to impress this huge audience, the actors wore strongly defined masks with a kind of megaphone in the mouth, and, for tragedy, were heightened by the *cothurnus*, buskin or thick-soled boot. Exactly where they stood in relation to the chorus which surrounded the altar of Dionysus has not been fully agreed upon, but they were not enclosed, and upon the "scene" behind them mechanical devices, flying cars for mortals going up to heaven and for gods coming down to earth, and machines for apparitions and murder tableaux (for all deaths happened off the stage), came into use.

#### Unities of Time and Place

Aeschylus himself introduced painted accessories and appropriate costumes. Anything in the way of subtle by-play cannot have been possible, and the size of the theatre and neutral scene were largely responsible for the unities of time and place, strictly observed by the Greek dramatists, but unnecessary where communication with the audience is closer or otherwise easier. These difficulties were, however, balanced by the fact that the stories and characters were known to the audience, taken always, as they were, from familiar legends or recent history.

The interest of the audience was, too, immensely heightened by the fact that every production was a public festival, that the expenses were subscribed as a state service by wealthy citizens, and that the plays were competitive, judged by a publicly appointed jury. Each dramatist supplied a trilogy, or set of three connected pieces dealing with the same subject, and sometimes, as in the case of Euripides'

Cyclops, a satyr-drama as well. Roughly, the best way of suggesting the spirit pervading an Athenian audience in the days of Pericles would be to combine the ritual of a cathedral service with the open-air aspect, popularity, and competitive enthusiasm of a football match.

**ROMAN DRAMA.** Although from many points of view it was, even at its best, a mere echo of the Greek, Roman drama had, until quite recent times, an at least more direct influence upon the drama of Europe. From the first the tendency of the native Italian drama was in the direction of broad farce, this being due to the fact that until Rome as a city began to borrow its art from Greece, the indigenous theatre was almost entirely rural. None the less, in the *Atellane Fables*—so named from *Atella*, in Campania, supposed to be of Oscan birth, and transferred to Rome after the subjection of Campania (210 B.C.)—is to be found the origin of that invaluable tradition of rural comedy, which was destined in its later form, as the *Commedia dell'Arte*, to permeate Europe. By the inherent force of its plots and characters it became one of the main inspirations of modern comedy, and still more of the comic side of modern melodrama, quite apart from being superficially celebrated in the now almost vanished harlequinade.

In their earliest known form the *Atellane farces* already included a gluttonous character (*Maccus*), of whom traces are still to be found in *Pulcinella*; a comic heavy father (*Pappus*); a foolish chatter-box (*Bucco*), and a clever rogue (*Dorsenus*).

As with Greece, serious drama first made its appearance in Rome with a national victory. After the first Punic war, Livius Andronicus wrote tragedies as well as comedies in imitation of the Greek tragedians. Naevius (c. 236 B.C.) followed with similar themes, and Ennius (239–169 B.C.) also wrote tragedies with Euripides as his model. The one Roman tragedian, however, who has influenced later ages was Seneca.

#### Influence of Seneca

Seneca's imitations of Euripides affected all the early Renaissance dramatists of Europe, supplied Ben Jonson with direct models, and are indirectly to be traced in Shakespeare himself. In comedy Plautus and Terence, already mentioned, remained current classics until the time of Molière, who founded his own art largely upon them. With the Empire the Roman drama declined to mere spectacle

and material splendour. The art of dumb show or pantomime (strictly so called) reached its height, a logical consequence of the size of the theatre and the non-participation of the audience in the spirit and purpose of the play. But of all this nothing remains.

**THE MEDIEVAL DRAMA.** From the death of Seneca until the Renaissance—save for isolated exceptions, like the astonishing Latin comedies of the 10th century nun, Hroswitha, of Gandersheim, in Saxony, said by her to have been written "in the style of Terence," but marked by a curiously naïve blend of religious ardour and wholly serious sympathy with extremes of human passion—the drama as a fully equipped art practically ceased to exist. It was violently opposed by the early Christian church—and quite understandably, considering its lamentable degeneration.

#### The Church and the Drama

Things changed, however, when the Church had grown in power. The demand for dramatic expression, above all among the illiterate, became urgent, and pagan festivals, with their essentially dramatic potentialities, still lingered in popular tradition. To meet the demand, plays began to be produced under the control of the Church itself. They were originally part of the actual liturgy—hence the name mystery, or, more properly, ministry plays—extensions of the tropes or short dramatic scenes, such as the uncovering of an empty tomb upon Easter day, and the representation of the manger at Bethlehem at Christmas, introduced into the Mass itself.

Gradually the laity cooperated in these performances, which, under the auspices of the trade-guilds, were brought out into the market place upon pageants, or wheeled stages. Written in the vernacular, and enlivened with racy scenes of common and contemporary life, the mysteries, or miracle plays, as they were also called, became the regular drama of the people. They flourished first in France, and afterwards all over Christian Europe. Ignoring consistency, they brought in God the Father, the Devil, Christ, and figures from every Bible story, together with clowns and characters of their own time. In England three collections of these plays survived—the Wakefield, Chester, and Coventry series—and still possess a high value and beauty, for all their simplicity, as living folk-dramas.

With and after the miracle plays flourished also the moralities, or allegorical sermon plays, of which

Everyman is so fine a type. These drifted after a while, with the Vice as a stock comic-character, into secular channels. Meanwhile both the moralities and miracle plays tended to blend with the performances of wandering mimes, *joculatores*, or jugglers, and *ministeriales* or minstrels. Also, purely secular and destined to reach their highest development long after both miracle plays and moralities had been ousted by the enfranchised drama, the old Italian *Commedia dell'Arte* (or Professional Comedy), and Comedy of Masks, had survived from classic Rome, and were growing into new life.

#### Italian Repertory of Rough Farce

As the travelling companies made their way from town to town, first through Italy, afterwards through France, Spain, Germany, and England, character by character, Harlequin, Columbine, Pantaloon, Pulcinella, and the rest, were building up their repertory of rough farce. As with their Attellane prototypes, it has been claimed that the dialogue of these Italian merry-makers was, in some cases wholly, and in others largely, impromptu. The probability remains, however, that memory played a not unnatural part with performers who were, in the earlier days, often illiterate, and that their stock of scenes to a great extent consisted of the debris of old Greek and Roman classics, orally conveyed, with only a certain amount of "gagging."

**THE RENAISSANCE.** In England, lay performances in the universities and elsewhere, both of Latin comedies and of translations, were encouraged, partly for anti-papal purposes, by Henry VIII and Edward VI. In 1551 appeared the first English comedy, Ralph Roister Doister, based by Nicolas Udall upon Plautus's *Miles Gloriosus*; and in 1562 the earl of Dorset and T. Norton produced the first English blank verse tragedy, *Gorboduc*, or *Ferrex and Porrex*, inspired by Seneca's *Thebais*.

With these plays, and with John Heywood's *Interludes*, the revival of English secular drama may be said to have been launched. With the same speed that characterised the advance of Greek drama, the crude and heavy-footed *Gorboduc* was followed in twenty-six years by the arrival of Marlowe's *Tamburlaine the Great* (1588). Displaying the verse-form that was to be carried to perfection by Shakespeare, always inspired with the fire of an undoubted genius, it was charged at every point with the insatiable

appetite for romantic adventure and the fearless assertion of humanity that was to characterise the Elizabethan drama.

The dramas of Shakespeare himself and those of his chief contemporaries are dealt with under his and their names. Whether one regards the lesser members of that brotherhood as over-praised or under-estimated, the Elizabethan drama as a whole did share certain qualities with Shakespeare himself. It shared his freedom, his delight in humanity, and something, at any rate, of his vigour. Even in the most extravagant gashlines of Webster and Tourneur the exploration of human possibilities is frank and exuberant.

Master of all the human moods, and incomparably beyond his fellows in technical skill, in his power over language, in his knowledge of human nature, and in the patriotism that informed his chronicle plays, Shakespeare was able to unite all these elements into a new form of drama. It was superficially romantic drama, but by the force of his imagination he was able to give his creations the rondure of life itself. They have at will the individual truth of comedy and the universal symbolism of tragedy. Romance was the material common to his time, which he found to his hand. He invested it with the deepest possible humanity, and in this way baffled posterity. Wherever Shakespeare has been understood, impersonal tragedy has become obsolete; but he has left nothing imitable, save the romance.

#### Spanish Drama of Lope and Calderon

Meanwhile an outburst of vast importance to the future of drama was happening in Spain, where Lope de Vega (1562-1635), the most amazingly prolific genius ever known, was writing his 1,500 plays and 300 *autos*, and much else besides, bringing life and elegance and nobility and brilliance both of wit and of intrigue to the Spanish drama. He was to be followed by a finer poet, the soldier-priest Calderon (1600-81), of whose hundred plays the beautiful *Life is a Dream* is the most famous.

Important in itself, the Spanish drama of Lope and Calderon is the more so for having directly inspired the father of French drama, Pierre Corneille (1606-1684), to the writing of *Le Cid*, with which the great age of French tragedy began. At this time the English drama, apart from the gorgeous and often beautiful masques at court and elsewhere, among which Milton's *Comus* is to be counted, was de-

generating, after the Elizabethan blaze, into a condition which made the Puritan suppression of the theatres a partial benefit.

Corneille and Racine (1639-1699) gave to France a classic drama still unrivalled in its blend of fine passion, of form, of dignity in character, of technique of verse, and dexterity of intrigue, within rigid conditions. Needless as seems the strict following of the unities of time and place, and the arrangement of all deaths so that they happened off the stage and had to be narrated, it suited the highly critical and leisured audience of the court of Louis XIV—a very different one from the rough-and-ready throng of high and low that filled the old Globe and Bankside theatres.

#### The Genius of Molière

Just sixteen years younger than Corneille, and seventeen years older than Racine, France's unchallenged master of pure comedy, Molière (1622-73), made his own rules, and was content to be the classics' debtor rather than their slave. To Plautus and Terence he owed much, to the Italian comedians possibly more; but his genius has remained, within its limits, as essentially his own as Shakespeare's. While he ridicules types, and borrows plots, his creations live their own life, and he remains, at the heart of him, unimitated. The so-called English "comedy of manners" of the English Restoration, tainted with the vice of Wycherley (1640-1716) and the sparkling but salacious grace of Congreve (1670-1729), was based upon him and stole freely; but failed to convey the real life of a single one of his characters, or a trace of his essentially sane and pure humour.

**THE 18TH CENTURY.** As to dramatic classics, nothing approaching the output of the century 1550-1650 has since been contributed to the world's store. In England the 18th century produced many fine actors, and one tragedy worth mentioning, Home's *Douglas* (1757), which is said to have been inspired by the Italian Maffei's masterpiece *Merope* (1713). In comedy there were the grace and good humour of Goldsmith's *She Stoops to Conquer* and *The Goodnatured Man*, and the rhythmic brilliance of all Sheridan's dialogue, especially in the perfect polish and form of *The School for Scandal*.

While in other European countries the interest in the drama was declining in favour of the actor,

Germany, delayed by the Thirty Years' War, was having a belated dramatic outburst of its own. This began with the arrival of Lessing (1729-81) as a kind of critic-ordinary to the Hamburg theatre, his championship of Shakespeare against the tyranny of pseudo-Greek classicism, and the consequent inauguration of the "romantic movement" which inspired Schiller (1759-1805), and brought the great mind of Goethe (1749-1832) to bear upon the stage and to produce Faust, Götz, Egmont, and the romantic Iphigenia.

**THE 19TH CENTURY.** A French romantic movement, also largely inspired by Shakespeare, though not entirely so, led to the defiance of the classic traditions by Victor Hugo (1802-85) in *Cromwell* and later in *Hernani* and *Marie Tudor* and other cloak-and-sword plays. Under the same influence De Musset wrote his delicate *pro-verbes*. Also here should be mentioned Coppée (1842-1908), a scion of the same romantic movement, Edmond Rostand, whose *Cyrano de Bergerac* (1897) was immediately assured a lasting fame, and Maeterlinck's intimate *Pelléas et Mélisande* (1892).

#### Comedies and Farces

Apart from romance, the vogues of sentimental domestic comedy and melodrama, varied with farce, were on both sides of the English Channel distinctive of the earlier 19th century. The comedies of Augier (1820-89) were largely responsible for inspiring T. W. Robertson (1829-71) to his series of carefully produced domestic comedies that began with *Society* (1865). The influence of Scribe (1791-1861) and of Sardou (1831-1908) with his ingenious arrangements of plot for the exploitation of insincere passion in glamorous surroundings, supplied all sorts of popular and acting successes, but was not for the ultimate benefit of the art of the drama. Dumas fils, with *La Dame aux Camélias* (1852), started the problem-play, dealing half-sentimentally, half-argumentatively, but never quite sincerely, with a thesis of sexual morality.

In England the Robertson comedies supplied the model for the earliest work of Sir Arthur Pinero (1855-1934), who from domestic comedy and finely constructed farce began to deal with more serious matters in *The Profligate* (1889), and established his position as a leading dramatist with *The Second Mrs. Tanqueray* (1893). In this was felt the influence of Ibsen (1828-1906),

who from Norway has had so strong an effect upon European drama. Following up his poetic plays, Peer Gynt and Brand, with intensely naturalistic comedies, tending ultimately to symbolism, Ibsen not only made for ruthless truth alike of purpose and detail abolishing asides and soliloquies, but also, above all in his comedy of Rosmersholm, introduced the technical design of the gradual revelation of the past by strictly natural means.

**20TH CENTURY DRAMA.** After Sir Henry Irving (d. 1905), no actor emerged who was more important than his material, and from that time Bernard Shaw became beyond question the great man of the theatre. Plays, *Pleasant and Unpleasant* (1898) numbered seven—among them his first brilliant comedy, *Arms and the Man*, originally produced in 1894, *Candida*, and *You Never Can Tell*. Yet he did not become a profit-making dramatist until the establishment of the Vedrenne-Barker management at the Court Theatre (1904-07). He was the only Victorian dramatist whose popularity went on increasing, though Oscar Wilde became a period-classic, and Barrie's Peter Pan remained a Christmas institution. The popularity of Shaw's historical plays *Caesar* and *Cleopatra* (1907) and *Saint Joan* (1924) is a reminder that it was he who put an end to the idea that every play dealing with a pre-Jacobean time should be in blank verse. Of other playwrights noted in Victorian days, Galsworthy is read as a novelist and respected as a dramatist, but seldom staged to financial profit. Pinero is occasionally revived; but Henry Arthur Jones, R. C. Carton, Haddon Chambers, Anthony Hope (especially his *Adventure of Lady Ursula*, 1898), Capt. Robert Marshall, and Alfred Sutro are other Victorians deserving of more attention than has been paid them, even in broadcast versions. Somerset Maugham, though he ceased to write for the stage after *Sheppey* (1933), remained consistently in vogue.

#### Replacement of the Actor-Manager

The decline of the actor-manager had already begun with the rise of syndicates before the First Great War—indeed, after the death of Sir Herbert Tree (1917) there was no universally acknowledged personal head of the actors' profession in Great Britain. The replacement of the actor-manager by the producer did not help the discovery

and training of new dramatists. The success of author-managers like Noel Coward and Ivor Novello, both of whom at times achieved complete control over their productions as actor, author, composer, and manager at once, did not result in the development of any general system of author-managership.

#### Between the Two Great Wars

The interval between the First and Second Great Wars was not particularly fruitful of good plays. It may be that the competition of the cinema, particularly after the advent of the talking film to some extent deflected the interest of young authors from the living stage; and the influence of Shaw, preeminent writer of the discussion-play, tended to lead younger dramatists to neglect the imaginative, emotional, and constructional effort needed for the attainment of dramatic power. But for three decades the drama in Great Britain was distinctly lacking in playwrights with fresh, outstanding, and fully-equipped creative genius. The passing of melodrama under the competition of the cinema and the decline of poetic and romantic drama in favour of operette was already marked before the Second Great War. The decrying of sentiment—in spite of the charm of such plays as Monckton Hoffe's *Many Waters* (1928)—led to the production of "comedy-thrillers" of insincere and partial appeal. Frederick Lonsdale turned from the writing of librettos to that of piquant comedies like *The Last of Mrs. Cheyney* (1925) and *On Approval* (1927). Ashley Duke's *The Man with A Load of Mischief* (1924) was a fine example of ironic comedy.

J. B. Priestley, starting as an original dramatist with *Dangerous Corner* (1932), for a year (1934-35) adventured as a dramatist-manager at the Duchess. He won popular success with *Laburnum Grove* (1933) and *When We Are Married* (1938); but several of his later plays, such as *They Came to a City* (1943), were debate on the Shaw model rather than drama. James Bridie, successful author of *The Sunlight Sonata* (1928) and *The Anatomist* (1931), evolved a kind of modern miracle-play technique with *Tobias and the Angel* (1931) and *Jonah and the Whale* (1932). His *Mr. Bolfrey* (1943) was one of the best wartime plays. Terence Rattigan's *Flare Path* (1942), *While the Sun Shines* (1944), and *Love in Idleness* (1945) were wartime successes, and his

French Without Tears (1936) ran for over 1,000 performances.

Emlyn Williams, after winning popular favour with the thriller, *Night Must Fall* (1935), and the autobiographical *The Corn is Green* (1938), turned to more imaginative work in, for instance, *The Light of Heart* (1940) and *The Wind of Heaven* (1945). Ronald Duncan's satirical fantasy *This Way to the Tomb* (1945) struck a new note. Both John van Druten, author of *Young Woodley* (1928), and R. C. Sheriff, author of *Journey's End*, produced the next year, sought their later opportunities and public more in the U.S.A. than in Great Britain. The death of Rudolf Besier in 1942, whose *The Barretts of Wimpole Street* (1930) is likely to survive as a biographical classic, was an especial loss. Esther McCracken's *Quiet Wedding* (1938), followed by *Quiet Week-End* (1941), and *No Medals* (1944) gave her the record in long runs for plays by women. Aimée Stuart (*Summer Snow*, *Jeannie, etc.*), Gordon Daviot (pen-name of Elizabeth Mackintosh) (*Richard of Bordeaux*, etc.), and Daphne du Maurier (*Rebecca*, *The Years Between*, etc.) notably upheld the honours of the distaff side.

#### Repertory Theatres in Britain

During and after the Second Great War a remarkable growth in the desire for good drama in Britain was both met and stimulated by the setting up of repertory centres in London and the country. This movement, although handicapped at almost every point by the scarcity of actual theatres and the impossibility, for the time, of building new ones, led to an increase of provincial repertory theatres from 50 to 250 between 1940-46. Other signs of revived interest were the rise to national distinction (represented by an exchange of visits with the *Comédie Française*) of the Old Vic-Sadler's Wells repertory company with Laurence Olivier, Ralph Richardson, and Dame Sybil Thorndike, the popularity of Donald Wolfit's Shakespearean company both during the war and afterwards, the success of old comedy at the Haymarket under John Gielgud's management, and the creation of the Arts Council (*q.v.*). There was an increasing hunger, shown also in the growth of theatre clubs, on the part of a public to whom the theatre, seriously considered, was something virtually new.

At the same time neither in Europe nor the U.S.A. can any great new dramatic movement be

recorded. The Russian drama, which had given high hopes with Chekhov and his contemporaries, became hampered by political control. Though some American dramatists—e.g. Robert Ardrey with *Thunder Rock* (1939)—had an international appeal, no new great dramatist has arisen since the First Great War. The group of Irish dramatists who made Dublin a nest of genius in the days of Synge and Yeats, found a continuance of style in Sean O'Casey. Yet his plays, from *Junio* and the *Paycock* (1925) to *Red Roses for Me* (1946) have had little influence in Eire itself. Everywhere, including Central Europe, and especially Scandinavia—where neither Ibsen nor Strindberg had successors of equal weight—there was evidence of enthusiasm for good drama; but the immediate effect of both the First and the Second Great Wars was rediscovery rather than creation.

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**Drama.** Town of Macedonia, Greece, the ancient Drabescus. It is about 70 m. N.E. of Salonica, in the centre of an agricultural district. It was in the territory ceded to Greece by the treaty of Bukarest, 1913, and was occupied during the First Great War by the Bulgars in Aug., 1916, and recovered by the Greeks on Oct. 8, 1918. Near it is the plain on which was fought the battle of Philippi resulting in the defeat of Brutus and Cassius, 42 B.C. Pop., 29,339. Drama gives its name to a dept.; pop. 139,583.

**Drama League, THE BRITISH.** Founded in 1919 by Geoffrey Whitworth. The object of this organization was to develop and encourage the art of the theatre and to promote a true relation between the drama and the community. It endeavoured to federate all the societies and institutions that practise dramatic art with a serious intention, and by 1944 had affiliated some 5,000 societies that ranged from the smallest village group to the Royal Academy of Dramatic Art (*q.v.*). In 1935 the league moved to new headquarters at 9, Fitzroy Square, London, W.1, where its library housed 50,000 volumes. See *Amateur Theatre*.

**Drambuie.** Liqueur made in Scotland. The principal ingredients are whisky and honey. The recipe is said to have been given to one of the Mackinnons of Skye by a Highland gentleman in the bodyguard of Charles Edward Stuart, as a reward for assisting that prince to escape in 1745, and the recipe has been carefully preserved by successive members of the family.

**Drammen.** Old seaport town of Norway. Cap. of Buskerud co., it is on the Drammen River, where it enters Drammen Fjord, and is a junction 33 m. by rly. S.W. of Oslo. Picturesquely placed, it consists of three formerly separate towns—Bragernaes, Strømsø, and Tangen. It exports wood—some 4,000,000 logs being yearly floated down the river—wood-pulp, paper, and nickel ore. There are large saw-mills, ship-building yards, an iron foundry, and breweries. The pop. of 25,493 makes it the fifth town of Norway.

**Draper** (A.S. from Fr. *drap*, cloth). Originally one who made woollen cloth. Later applied to a dealer not only in cloth but in linen, as woollen-draper, linen-draper; now used generally to denote the seller of woollen, linen, cotton, and silken goods.

**Draper, HENRY** (1837-82). An American astronomer. Born in Virginia, March 7, 1837, he studied medicine in New York, and in 1861 became professor of physiology and analytical chemistry in the university there. His alleged discovery of oxygen in the sun in 1877 has long been disproved. He began the construction of his telescope for astronomical photography as early as 1858, and his work marked a great advance in lunar photography. The first promising autographic pictures of the Orion Nebula were



obtained by him in the autumn of 1880. He was engaged in a spectroscopic study of the stars when he died, Nov. 20, 1882. An endowment at Harvard Observatory by his widow provided for the continuation of this work.

**Draper, RUTH** (b. 1889). American entertainer. She was born in New York, made her first appearance



Ruth Draper, American entertainer

on the stage in 1915, and the following year acted with Marie Tempest in *A Lady's Name* at the Maxine Elliott Theatre, her only performance in a play. It was as a diseuse that she made her reputation. Without scenery and with the minimum change of costume she enacted scenes of tragedy, pathos, and comedy, contriving by change of voice and manner alone to populate the stage. She wrote her own material, and her art, based on acute observation and perfect timing, was at its best in such sketches as *Three Women* and *Mr. Clifford*; *Opening the Bazaar*; *Showing the Garden*. She came to London first in 1920, gave regular seasons until 1939, and returned in 1946. In the U.S.A. the term "drapering" signified her type of performance.

**Draper Catalogue.** Catalogue of the spectra of the 225,300 brightest stars in the sky, compiled at Harvard observatory and published 1917-24. Named after Henry Draper, first American observer of stellar spectra, it made possible the first classification of the stars by their physical characteristics. The Draper classification arranges the stars under the letters O, B, A, F, G, K, M, in order of decreasing surface temperature, most classes being subdivided decimally. Stars of class O are at about 30,000° C., M stars at about 3,000° C. By 1936 the catalogue had been extended to include 272,100 stars; thenceforward the tabular presentation was abandoned in favour of publishing charts with spectral types marked thereon.

**Drapers' Company.** Third of the 12 chief City of London livery companies. Originally the members were makers and sellers of cloth in and near London. They received the first of their seven charters in 1364, and were granted arms in 1439. The roll includes the founders of several noble

families, among them the Pulteneys, earls of Bath; the Capels, earls of Essex; and the Brydges, dukes of Chandos; also many lord mayors, including the first, Henry Fitz-Alwyn.

The guild first met in S. Mary Bethlem hospital church, Bishopsgate. Its first hall was in St. Swithin's Lane.

The mansion in Throgmorton Street of Thomas Cromwell, earl of Essex, was purchased in 1541, and burnt 1666. A new hall was built in 1667, and rebuilt in 1772-74 and 1866-70. From the existing garden a mulberry orchard once stretched down to London Wall. The company has large estates and a corporate and trust income of about £78,000, and administers numerous charities, including a number of almshouses. Since 1886 it has contributed nearly £500,000 for technical and general education at the People's Palace, Mile End Road, the educational side of which has now become Queen Mary College, London University. In 1887 it gave the site and £50,000 for Bancroft's school at Woodford; and it contributed largely to technical schools at various universities. Consult *History of the Worshipful Company of the Drapers of London*, A. H. Johnson, 1914.

**Drapier Letters, THE.** Series of pamphlet letters written by Jonathan Swift in 1724 over the signature M. B. Drapier. In these he protested vigorously and successfully against the job by which a royal patent had been granted to William Wood for coining halfpence and farthings for circulation in Ireland, against the wishes of the Irish parliament.

After the appearance of the first of the letters a committee reported in favour of the patent, but recommended that the amount to be coined should be reduced from £100,800 to £40,000. In his fourth letter Swift used with great force the argument that government without the consent of the governed was the very definition of slavery. A reward was offered for the discovery of the authorship of this letter, and the printer was prosecuted. Swift admitted the authorship, the patent was surrendered, and M. B. Drapier became a popular hero. See *Swift*.

**Draught.** Term used in various meanings. (1) The least depth of water in which a ship can float with-



Drapers' Company arms

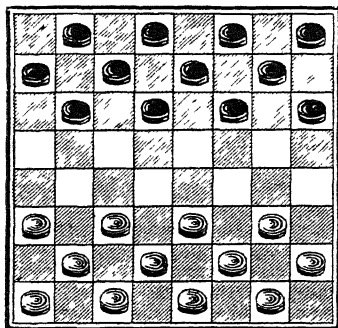
out touching bottom. The largest vessels have a draught of about 35 ft. when fully laden. Draught scales are printed on the bow and stern post. (See *Load Line*.)

(2) The current of air passing through a grate or a furnace to promote combustion. Air is necessary to combustion because it supplies the oxygen required to bring about the chemical change resulting in the evolution of heat and flame. By control and regulation of the draught the rate of combustion can be governed. Natural draught is brought about by connecting the fireplace or furnace with the open air by a long pipe or chimney. The column of air within this chimney is ordinarily warmer than the outside air, even in the absence of a fire; consequently this column is less dense and lighter than the free air around. Such free air displaces air in the chimney, forcing it up and out and setting up a circulation which continually brings new air into the room. Kindling a fire in the grate or furnace adds to this circulation, while the extra oxygen then reaching the fuel bed quickens the rate of combustion and makes the fire burn up. The damper in the fret of an open fire grate helps to control draught. This system is further applied in domestic boilers: the furnace is fully enclosed, while the damper is operated automatically by a thermostat to maintain the rate of combustion within the desired temperature range. Forced draught is the supply of air under pressure to the furnace by means of a steam jet in the chimney base (e.g. locomotives), or by the use of fans or blowers. Down-draught is a reverse current in the chimney, which may be brought about by air eddies, the presence of higher buildings, or wind. (See *Chimney*.)

(3) In masonry, that part of the surface or surfaces of a stone block which is chiselled away as a guide to reducing the whole surface to its proper form and proportions. With large stones needing much reduction several parallel draughts are made.

**Draughts.** Game of skill played with 24 disks or draughtsmen on a chequered board of 64 alternate black and white squares. It is of great antiquity, forms of it being known in ancient Egypt, Greece, and Rome. The game was played in the mid-17th century much as it is today. In the U.S.A. it is known as checkers.

Two players have each 12 men, one selecting white, the other



Draughts. Board set out with men ready for playing

black; they are set up in three rows at each end of the board. In Scotland the black squares are sometimes played upon; in England the white. The board is placed so that when playing on the white squares a black square is at the players' right hand; or vice versa. A man is moved one square at a time in a forward diagonal direction, and "takes" an opponent's piece by passing over it whenever there is a vacant square beyond, and removing it from the board. Providing there are vacant spaces intervening, it is possible to move over (and take) several men.

Each player moves alternately, and the game may be won by either forcing all an opponent's men from the board or blocking those that remain in such a manner that it is impossible for him to make another move. When a player succeeds in getting one of his pieces across the board into the last row it is crowned by placing another piece upon it, and becomes a king, thereby acquiring the privilege of moving either backwards or forwards. When it is possible to take a man it is compulsory to do so; the penalty for noncompliance being the huffing (removal from the board) of the offending player's piece by the adversary before he moves.

**Drave** or **Drav**. River of Central Europe, forming part of the boundary between Hungary and Yugoslavia. It is the longest of the tributaries of the Danube which flow E. from the longitudinal valleys of the E. Alps (450 m.). Its upper part is ice-bound in winter and the whole stream is subject to spring floods. It is navigable for steamers to Barcs, for boats to the confluence with the Mur, and for rafts from Villach down stream. The river rises in the Puster Thal in Tirol, receives the drainage from the Hóhe Tauern and the Carnic Alps,

and flows in a narrow Alpine valley through Carinthia. Below Marburg (Maribor) the valley widens, while below the Mur confluence there are few towns on its bank owing to danger from floods.

**Dravidian**. Name given to an ancient non-Aryan race in S. India and Ceylon. They are dark, broad-nosed, thick-lipped, curly-haired, and long-headed. The Brahui of Baluchistan, who speak a Dravidian language and are sometimes included among the Dravidians, are short, with olive complexions, brown hair and beard. The Dravidians are by some held to be related to the Australian aborigines; by others to the Negroid race. A style of architecture, often called Dravidian, is preferably designated S. Indian. See India; also Cave Temple illus.

**Dravidian Languages**. Group of languages spoken by the Dravidians in Baluchistan, N. and S. India, the Deccan, and Ceylon. The people are non-Aryan, and their language, although its vocabulary contains a considerable Sanskrit element, has a distinctive grammatical system. It is agglutinative, the first part of a word always remaining unaltered, different relations being expressed by different suffixes glued on to it. For this reason some assign the Dravidian languages to the Turanian or Ural-Altaic family, but others regard them as standing alone and unconnected with any

other linguistic group. The grammar is on the whole simple, and the vocabulary, apart from Sanskrit borrowings, does not indicate a very advanced state of civilization. There is no relative pronoun, and the negative verb is expressed by a special form.

The chief dialects are Telugu or Telinga, Tamil, Kanarese, Tulu, Malayalam. Of these Tamil and Telugu, spoken by the greatest number of people, are the most important. These five dialects are written languages, with special alphabets of Sanskrit origin, the literature consisting mainly of religious and didactic poems, lyrics, epics, and medical works. It contains versions of great Sanskrit epics, the Ramayana in Tamil, the Mahabharata in Telugu. An ethical poem, Naladiyar, of the 10th century, also deserves mention.

**Drawback**. Term meaning the repayment by the public authorities of money already paid as customs or excise duties. This is usually done when articles liable to taxation are exported, or, having been imported, are re-exported, and its object is to enable the trader to compete in foreign markets. Thus a trader, having paid the customary duties on wines imported by him into England, might wish to sell them in Norway. Having complied with the necessary formalities, he would have returned to him the drawback, or money already paid.

## DRAWING: BASIS OF THE FINE ARTS

Gordon Stowell, A.R.C.A. (Lond.)

*This statement of general principles includes an account of the development of line drawing among the book and magazine illustrators of the 19th and 20th centuries. See also Advertising; Art; Caricature; Cartoon; Etching; Lithography; Painting; Perspective; Poster; Wood Engraving; and biographies of artists mentioned*

Drawing is the representation by pictorial or diagrammatic means of objects seen or imagined. The purpose of the diagrammatic sort is to convey accurate information as to construction, materials, dimensions, processes, mechanical action, etc. They are typified in the working drawings of an engineering draughtsman or the architectural designer's plans, elevations, and cross sections. Mechanical means are employed, i.e. rulers, compasses, etc., together with various conventions intelligible only to the specialist for whom they are prepared. A type of informative diagrammatic representation, equally specialised but more generally familiar, is the map.

What is more commonly understood as drawing is the pictorial

kind. This may also be a vehicle of information but only approximates to accuracy, being dependent on the judgement of the artist's eye and the skill of his hand, as well as being further conditioned by his particular emotional or intellectual intention and the limitations and peculiar qualities of his chosen medium. As to the last, if most people think of a drawing in terms of pencil or pen-and-ink and paper, it is because these are the commonest and most accessible tools. But the range of media is without limit. It includes chalk, charcoal, crayon, paintbrush, airbrush, scraper, etching needle, engraver's burin—anything, in fact, that can record an intelligible mark on any surface capable of recording it—

down to a child's finger on a steamy window.

To express himself and his world by drawing is one of man's natural gifts. The practice of drawing is older than that of writing, of which it is the parent. Caves inhabited by prehistoric man are decorated with pictures of extraordinary merit and fidelity of observation (see *Altamira*; *Art, Prehistoric*, col. plate), which suggest that he drew for pleasure, as a child draws. Civilization has tended to destroy rather than foster this inborn gift, so far as most people are concerned; but educational reformers have endeavoured to revive the tendency. For example, since 1890, drawing has been compulsorily taught in English primary schools and has become a recognized part of the syllabus of all good secondary schools. The teaching has not been on uniformly intelligent lines, but 20th century methods have been revolutionised by the remarkable results obtained by such original teachers as Thomas Ablett (1849-1945) and Marion Richardson in England, and Cizek (1865-1947) in Austria, in their encouragement of free expression in drawing from memory and imagination and of the enjoyment of the decorative qualities of pattern making for their own sake.

#### Line Drawing

The simplest convention used in drawing is that of line, so universally accepted, today as in ancient Egypt, that we often forget that it is only a convention, that shapes and colours are not in reality bounded by outlines. Pure line, the natural outcome of any pointed instrument such as a pencil, demands a precision of statement more difficult to attain than is commonly supposed. But drawing is still drawing, even when line is dispensed with in favour of solid masses of varying tone values, as in a monochrome painting or an aquatint. Most of the drawings in "half tone" which accompany the stories in an illustrated magazine are of this kind; or they may combine line and mass. Painting itself is only drawing in masses of colour. The arranging, or "composing" of the component parts of a picture may come under the heading of design, but the actual defining of them is sheer drawing; and to the true artist the two are inseparable. Line and colour are often effectively combined, as in the water-colour drawings of the English topographical artists of the late

18th century. Indeed, the artist has unlimited choice of technique and of medium. J. M. W. Turner in his water-colour drawings called in the help of penknives and sponges. The silhouettist can obtain striking effects with scissors and black paper. It is all drawing, in the broadest sense.

#### The Laws of Perspective

As drawings are usually made on a flat, or two-dimensional, surface, the essential problem of the artist is to present on that surface the illusion of three-dimensional reality. He achieves this by following the laws of perspective. These enable him to represent, say, a box as the eye may see it—front, side, and top, all at once. A box is only the simplest example: in the pictorial representation of everything three-dimensional from twenty square miles of landscape (introducing a further complication in what is called aerial or "atmospheric" perspective) to a single human face in profile, the laws of perspective are inescapable.

Correct perspective, correct proportion—these are the elements of good drawing. Where they are deficient the work of the artist is commonly described as "out of drawing." Other means towards the desired end include the correct recording of light and shade, of tone values, of colour values. Refinements in technique may enable an artist to suggest such lesser qualities as the bluntness or sharpness of an edge, the texture of a given surface, or even the relative weights of things.

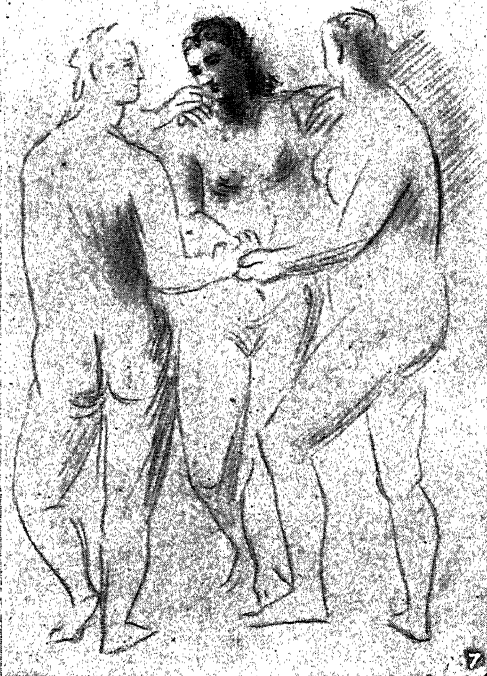
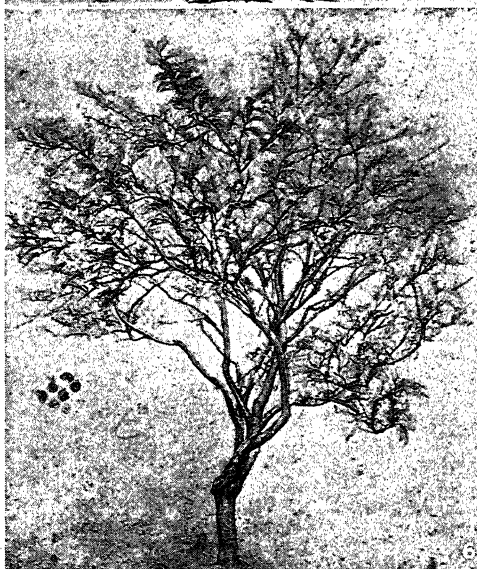
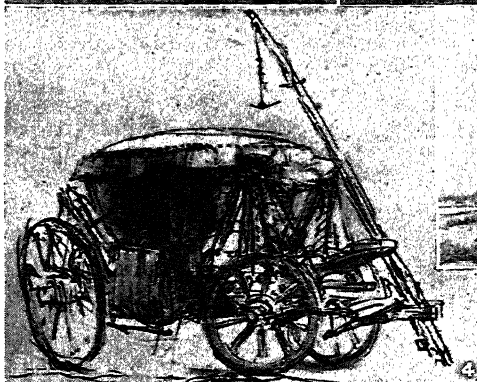
Drawing is the basis of all painting, sculpture, architecture, and many decorative crafts. Theoretically, and to some extent historically, it aims at an approximate illusion of three-dimensional reality. But in practice, if that were all, a camera can do as much with infinitely less expenditure of human effort. Photographic "likeness" achieved by the human hand may be as much of a technical marvel as that perfect circle which Giotto is said to have drawn freehand, and is equally useless from any other point of view. But, as already stated, all art is consciously or unconsciously conditioned by the individuality of the artist and the limitations of his medium. It is just this variable falling-short of perfection which enables us to distinguish and enjoy the individual qualities of a great draughtsman—the grave eloquence of Holbein's line, the precision of Dürer's or Leonardo's, the rich

dramatic vigour of Rembrandt's, the lyrical grace of Botticelli's, the finesse of Canaletto's, the austerity of that of Ingres. All these and many other great artists are respected for their superb powers of draughtsmanship, whatever other qualities their work may possess. On the other hand, many others, equally great, are recognized as being greater colourists than draughtsmen (e.g. Turner), or have concentrated on other aesthetic qualities such as atmospheric effect or decorative pattern. While yet others (e.g. Blake, El Greco) are great artists by virtue of qualities transcending both their draughtsmanship and their colour. It has been left to the so-called "modern" painters to demonstrate with some emphasis the truth that in a picture which is deliberately and even violently "out of drawing" may yet reside some unassailable aesthetic virtue. The work of Dali and many of the Surrealists is marked by much exquisite draughtsmanship, even judged by the most exacting academic standards. For other "moderns," such drawing is still the basis of their art, but only as a point of departure in their legitimate quest for whatever deeper truths exist that can be revealed by surface appearance.

#### Marvels of Wood Engraving

A popular form of drawing, necessitating the fullest exploitation of the potentialities of pure line, developed in England during the 19th century with the art of book and magazine illustration. It was largely due to the emergence of a school of highly-skilled commercial engravers in wood, led by Dalziel, Swain, and Linton, in whose hands wood-engraving became a thing to marvel at. They made it possible to reproduce a delicacy of touch and depth of tone far beyond the range of the older, more expensive, and more forbidding steel engravings. The basis of the engravers' work was, of course, line; effects of shade, shadow, and tone were achieved by hatchings and cross-hatchings of varied intensity.

The excellence of their work led directly to the establishment of many popular illustrated periodicals from the earliest years of Victoria's reign. The Illustrated London News and the Graphic, pioneers in a new branch of journalism, owed everything to it; but for the most part the draughtsmanship of those artists who anticipated the rôle of the news photographer was much inferior to the craftsmanship of their



Examples illustrating the differing techniques of half-a-dozen of the world's great draughtsmen. 1. Sir Thomas More, crayon portrait by Holbein (1497-1543). 2. Study in chalk of a woman's hands, by Dürer (1471-1528). 3. Woman's head, by Leonardo da Vinci (1452-

1519). 4. Pen drawing from one of the sketch books of Rembrandt (1606-69). 5. Landscape etching by Rembrandt. 6. Pencil drawing of lemon tree, by Leighton (1830-96). 7. Study for The Three Graces, by Pablo Picasso (b. 1881)

**DRAWING: THE ARTIST'S DELINEATION OF THINGS SEEN OR IMAGINED**

engravers. On the other hand, the reputations of several fine artists were secured in the pages of Punch, among them being Leech, Doyle, Tenniel, Keene Du Maurier, and Sambourne. Moreover, books, and especially children's books, began to be more generally accompanied by illustrations from wood engravings. It is notable that Tenniel and Sambourne excelled themselves respectively in their drawings for the Alice books (1865 and 1871) and Kingsley's *The Water-Babies* (1863). The art reached its full flower in the 1860s and 1870s in such journals as *Once a Week*, the *Sunday Magazine*, the *Cornhill*, and *Good Words*, and the delightful line-work of Millais, Sandys, Boyd Houghton, Charles Green, Pinwell, Fred Barnard, etc.

#### Introduction of Photo-Engraving

With the onset of photographic processes of pictorial reproduction towards the end of the century this beautiful art suddenly died out. Not only was photo-engraving much cheaper but it reproduced with infinitely greater fidelity anything the artist liked to draw, in either line or half-tone. The number of illustrated magazines grew beyond counting all over the world, and artists equally innumerable were discovered to supply their needs, as well as the needs of advertisers, who were quick to seize the opportunity for a fuller wealth of pictorial display. Possibly illustrating became too easy; possibly the public became surfeited and over-indulgent; whatever the reasons, a decline in standards of draughtsmanship followed swiftly.

True, the inspiration of the earlier artists lingered into the first two decades of the 20th century and is recognizable in the best black-and-white art of the period. The outstanding genius of Phil May, one of the greatest draughtsmen of any age, lay in a studied economy of line which enabled him to express more exact observation with one stroke of the pen than most of his contemporaries could achieve in fifty. Other illustrators of those days who helped to postpone the eventual decay of good draughtsmanship include Hugh Thomson, Edwin Abbey, W. Heath Robinson, Edmund Sullivan, and H. R. Millar, as well as many of the later Punch artists, e.g. Baumer, Raven-Hill, Fred Pegram, F. H. Townsend, Claude Shepperson, Frank Reynolds. The technique of all these popular artists is worth close study, as are the more mannered styles of Sir

Bernard Partridge, Harry Furniss, H. M. Brock. But by 1920 the heyday of such men had passed. Since then good draughtsmanship in popular art has been increasingly forsaken in favour of decorative or humorous mannerisms, qualities perhaps equally estimable but owing nothing whatever to a great English tradition.

In addition to the accompanying reproductions, examples of good drawing, too numerous to mention, are to be found among the illustrations to this work, but see particularly the examples of Caricature, pages 1770-71.

**Drawing.** In metallurgy, a term with several meanings: (1) "Drawing the temper" or "drawing back" is synonymous with tempering, which has now almost entirely displaced drawing, except in America. (2) In the solidification of castings, the formation of shrinkage or contraction cavities through unsuitable design is referred to as drawing. It may also result from insufficient feeding of the casting. (3) In mechanical working of metals and alloys, drawing is a process for producing rod, bar, or wire, the metal being drawn cold through a die consisting of a tapered hole in a draw plate. This reduces the diameter of the material and increases its length. Seamless tubing may also be produced similarly. Since drawing results in the hardening of the metal, only a limited amount of work can be applied at each operation before the metal becomes too brittle to be worked further. To continue drawing, if so required, the material must then be annealed. Drawing results in a distortion of the structure; it increases tensile strength and hardness at the expense of ductility.

In plastics, drawing is carried out by the extrusion of the material under pressure through a perforated plate (for rods), and, for short lengths of pipe or tube, round a former or core.

**Drawing Room.** Room in which company is received, sometimes known as parlour or reception room. In the 16th century this room, usually situated next the dining-room, began to be known as the with-drawing-room, because the family withdrew to it after meals. A formal reception of guests by a king or queen is also called a drawing room, and at such girls entering society, and women re-entering it as brides, are presented at court.

**Drawing Society,** ROYAL. Founded 1888, incorporated 1902.

The society was the pioneer, in Great Britain, of modern methods of teaching drawing to children. At a time when the official system was one of copying, known as freehand, it urged freedom for the child to draw what it liked in its own way. The methods devised by the founder, T. R. Ablett (q.v.), to use drawing as a means of developing observation, concentration, memory, and general intelligence, met with great success and have been widely adopted. The society examines over 30,000 papers annually from schools in all parts of the world, and for many years has held an exhibition known as the Children's Royal Academy, and awarded medals. Its address is 12, Cromwell Place, London, S.W.7.

**Draw Plate.** Name for a steel plate, through a hole in which, in manufacturing wire, a fine rod of metal is drawn. The hole is usually tapered, while the end of the rod is reduced a little to enable it to enter the draw plate sufficiently far to be seized by the draw bar. *See Wire.*

**Drayton, MICHAEL** (1563-1631). English poet and dramatist. Born at Hartshill, Warwickshire, a friend of Shakespeare and a shareholder in the Whitefriars Theatre, he is best remembered for the so-called "dry-eyed sonnet," *Since there's no help, come, let us kiss and part*; and the racy *Ballad of Agincourt*. He wrote a charming fairy poem, *Nymphidia*. His *Polyolbion*, a patriotic poetical topography of some 30,000 lines, is packed with allusions of antiquarian interest, but scarcely read. It was first published in its entirety in 1622. Drayton died in Dec., 1631, and was buried in Westminster Abbey. *Consult* M. D., a critical study, O. Elton, 1905.

**Dreadnought.** Name borne by first-class ships of the British navy almost continuously since 1573. It figured in the fleets which fought against the Armada, in the fights of the Dutch Wars, and in the battles of La Hogue, Cape Passaro, and Trafalgar. The hulk of the *Trafalgar Dreadnought*, launched at Portsmouth in 1799, was moored off Greenwich in 1830 to serve as a hospital for seamen, but she was broken up in 1857.

The ninth *Dreadnought* was the forerunner of the modern battle-



Michael Drayton,  
English poet  
*Nat. Port. Gall.*

ship. Her features were settled by a committee presided over by Admiral Sir John (later Lord) Fisher. The vessel was laid down at Portsmouth, Dec. 2, 1905, launched Feb. 10, 1906, and left for her trials on Oct. 1, this rate of construction for a large ship never having been approached previously. Her principal dimensions were: length, over all, 526 ft.; beam, 82 ft.; normal displacement, 17,900 tons. Her cost was £1,813,100. She was larger, faster (21 knots), and more costly than any earlier British warship, and was the first of any nationality, larger than a light cruiser, to be equipped with turbine machinery. Armament comprised nothing between ten 12-in. battle guns and 24 3-in. (12-pounders) for repelling torpedo-craft.

All battleships designed for the British navy from 1893 to the time of the Dreadnought had a main armament of four 12-in. guns, but while those provided for up to 1900 had a secondary battery of twelve 6-in., the King Edward class (1901-08) were given four 9·2-in. and ten 6-in., and the Lord Nelson class (1904) ten 9·2-in. The Dreadnought was thus in a large measure the natural development of a well-established tendency. Her ten heavy guns were mounted in five turrets, three on the centre-line and two abreast on the beams, so that eight guns could be brought to bear on either broadside.

By general consent all vessels subsequently designed on similar principles as to armament were up to the first Great War called dreadnoughts. Vessels built on the "all-big-gun" principle but having weapons heavier than the 12-in. were popularly known as "super-dreadnoughts." See Battleship.

**Dream.** An involuntary activity of the mind which occurs during sleep. The fact that dreamers seem to visit distant scenes is one of the origins of the belief in a soul or spirit which can leave the body and wander about at will. In some religions dreams are believed to be inspired by the gods and their interpretation plays a part in the magic of most primitive peoples. Interpretation was first put on a scientific basis by Sigmund Freud in his book, *The Interpretation of Dreams*. His theory explains both the function and structure of dreams and offers a clue to the unravelling of their meaning.

The dream is a defence mechanism the purpose of which is to guard sleep and to prevent the

dreamer from being awakened either by external stimuli or harassing mental impulses and problems. In order to achieve this the mind disguises the disturbing forces in such a way that they no longer demand an active response from the sleeper, e.g. the alarm clock is heard as a peal of bells, or the pangs of hunger are dulled by a dream meal.

#### Freudian Theories

Freud also maintains that all dreams are the expression of some wish. Where the wish is acceptable to the waking mind, sleep is preserved by its apparent fulfilment—the prisoner dreams that he is free; the candidate that he has passed his examination. Where the wish is inadmissible, and has been repressed because it is condemned by conscience, disguise becomes necessary, if sleep is to continue. The forms of these disguises are many and complex. Dangerous ideas may be replaced by apparently harmless symbols, as when sexual impulses are translated into climbing stairs or mountains, or the desire to kill some person is satisfied by dreaming that he has departed for some distant place. Other forms of distortion are alterations of emphasis, so that the most significant features of the dream appear as trivial changes in the feelings which would normally be attached to the dream situation; the use of composite images to represent several persons, objects, or desires; punning (e.g. 180 for "I ate nothing"); remembrance of dreams as far more rational and coherent than they were.

Some types of dream are associated with particular illnesses: feelings of suffocation with diseases of the lungs; terrible deaths with heart disease. Some are common to large numbers of people, e.g. dreams of impeded motion, particularly running, which betoken severe mental conflicts. Many individual dreams are determined by the events and moods of the preceding day, and the hidden wishes which they express spring from past situations which resemble those experienced during that day.

When the disturbing stimulus is so powerful that it defeats the distorting mechanisms, the dream images become less and less disguised until the dreamer wakes. He hears the alarm clock for what it is, or is roused by his nightmare. The acute discomfort and anxiety felt during nightmares, and their rapid disappearance, show both

the intensity of the conflicts between forbidden wishes and conscience and the efficiency of the control which prevents disturbance during wakefulness.

The interpretation of dreams can play an important part in the treatment of mental disease. It reveals both the nature and the sources of the patient's difficulties and (since different types of dream occur at different stages of illness) helps the doctor to judge the progress of the cure. See Dunne, J. W.; Free Association; Freud, S.; Psycho-Analysis; Repression; Super-Ego.

**Dream of Gerontius, THE.** Oratorio by Sir Edward Elgar, his opus 38 and one of his most popular compositions. It is for three soloists, mezzo-soprano, tenor, and baritone, with chorus and orchestra, and was first given under Richter at the Birmingham festival Oct. 3, 1900, Marie Brema, Edward Lloyd, and Plunket Greene singing. The words are the greater part of a poem by Cardinal Newman first published in 1865. With variations of metre and mood, the work is a vision of the progress of the soul from deathbed to judgement and purgatory. See Elgar; Newman, J. H.

**Drebbel, CORNELIS VAN (1572-1634).** A Dutch scientist. Born at Alkmaar, he is supposed to have invented the thermometer, but probably he only improved it. His instrument consisted of a glass tube with a column of water which rose and fell according to the expansion and contraction of the air in a bulb with the variations in temperature of the atmosphere. The secret of a bright scarlet dye which he discovered was introduced into France by those who established the Gobelin factory and gave the tapestries their reputation for brilliancy of colour. He also invented a submarine which navigated the Thames between Westminster and Greenwich.

The emperor Rudolf gave him a pension, and Ferdinand II made him tutor to his son, but a revolution in Austria led to his imprisonment. On his release he came to London, where he died. His principal works were two Dutch treatises (Leyden, 1608) on *The Nature of the Elements*, and *Quintessence*, published later in Latin and French. Consult *Life*, G. Tierie, 1932.

**Dredging.** The operation of excavating material from the bed of a river, harbour, dock,



canal or other water covered area. The chief objects of dredging are to maintain navigation by removing silt, to increase the depth of water, or to form new channels. Dredging is also employed for working over submerged gold and tin bearing strata and in reclaiming land.

Dredging machines are classified according to the means by which they move the material or spoil, such as bucket or ladder, suction or hydraulic pump, spoon or dipper, and grab. The first and second work continuously, the third and fourth intermittently. Some dredgers are fitted with buckets and pumps, some are self-propelling. Self-propelling machines are usually intended for work in exposed positions where the risk

ladder. The top "tumbler" is driven by steam engine through a gearing which includes a clutch or friction gear designed to slip if the buckets strike something very hard and the pull on the chain is excessive. The buckets move downward under the ladder at a speed of 10-20 buckets a minute dependent on whether the gear is in slow or fast speed, scoop up the material as they pass round the lower tumbler, and after ascending the upper face of the ladder over spaced rollers, discharge themselves into a shoot which delivers the spoil into a barge moored alongside.

When at work the dredger is anchored by chains or wires laterally and fore and aft, and is moved in any desired direction

means of powerful centrifugal pumps. Suitable trunnions are interposed between the top end of a tube and its pump, to allow the tube to be raised and lowered. The solid matter is mixed with several times its bulk of water and is separated by settlement in the hoppers of the dredger or dumb hopper barge.

Considerable difficulty sometimes results if the spoil is not thick, and sometimes a sand will not settle. In such cases bucket dredging is preferable as the material raised is almost free of water. The Leviathan, largest of suction dredgers, used in the Mersey, has four pumps which between them in an hour deliver into hoppers in the ship 8,000 tons of sand from a depth of 70 ft.

#### The Huge Dipper Dredger

The clay-cutting dredger is of the hydraulic type, but specially designed to excavate stiff clay. The nozzle end of a suction pipe is surrounded by a large bladed cutter, revolved by a shaft running along the top of the pipe. The blades cut off slices of clay which are sucked up by the pumps. The dipper dredger of a large size is used almost entirely in American waters. In its action it resembles the steam navy. The dipper, which consists of a large scoop—with a capacity up to 15 cu. yds.—mounted on a long arm works over the head of the boat or through a well. It collects its load with a circular upward sweep and dumps it into a hopper barge or on the bank, the load being released through a trapdoor on the bottom of the scoop. It is useful for dealing with loose rock, boulders, tree roots, and other difficult materials and is used extensively on the Panama Canal. The dredger is moored by large vertical sliding posts called spuds, fitted with a broader base which takes part of the downward thrust of the dipper.

The grab dredger excavates by means of a large bucket raised and lowered by chains running over the end of a boom. The bucket is made up of two or more jaws, hinged at the top, which fall open and close over their load under the lifting pull. Grabs are used in restricted situations for removing hard and soft matter. Some grabs weigh as much as five tons and will remove broken rock and large boulders. A self-propelled sea-going hopper type of grab vessel fitted with three grabs will excavate 350 tons of material an hour.



**Dredging.** A modern bucket dredger loading a 1,500-ton dumb hopper barge in Victoria Dock, London

*By courtesy of the Tisbury Contracting and Dredging Co.*

of damage to attendant dumb hopper barges would be so great as to prohibit this form of loading. The spoil is therefore stored in a large compartment inside the dredger, which when full proceeds to the dumping area in deep water and releases spoil by opening valves in the vessel.

The bucket or ladder dredger is used chiefly for clearing mud, sand, conglomerate, chalk, gravel, or stiff clay containing boulders and other hard material. The illustration above is of a dredger of this class. Situated in the hull is a longitudinal well open to the water, spanned near the head by a steel "A" framing which carries a powerful hoisting tackle attached to the free end of a strong ladder girder fulcrated at the higher point of a strong framing situated amidships. An endless chain of 40-50 steel buckets, joined together with strong links, runs round four-, five-, or six-sided tumblers at each extremity of the

by hauling on some of the cables and paying out others. The dredger progresses head first when cutting into the face of a bank, and sideways while working across the face. The full depth, which may be anything up to 70 ft., is attained while going across the cut ("bottom" dredging) or in several stages, dependent on the thickness of the material to be removed, the ladder being lowered after each stage ("top" dredging). Buckets are made in capacities up to 2 cu. yds. each. The largest can deal with boulders up to two tons. These are usually slung with the dredger's crane on being raised, and placed on the hopper's deck, for if they were tipped into the hopper's well they might do serious damage.

The hydraulic dredger is the most efficient machine for removing sand, silt, and other finely divided matter, which it sucks up through long pipes hanging over the side, or into a central well by

The rock breaker, though not properly a dredger, as it does not remove material, is much used to break up rock for removal by bucket or grab machines. The rock is shattered by heavy pointed rams or "pencils," weighing up to 25 tons each and shaped like elongated torpedoes, working through wells in the vessel's hull.

The method used for removing the material raised by a dredger depends upon the nature of the material and the conditions of the work. If the dredger is operating far from land, or if the spoil cannot be turned to useful account, material is usually carried by the dredger itself or by attendant hoppers into deep water, and there dumped. Dredgers working near land—for instance, in a canal or harbour—may find it convenient to deliver the débris on the banks or low-lying ground beyond. The spoil, mixed with a sufficiency of water, is delivered into the top end of an elevated trough-shaped conveyer, supported by the dredger and pontoons, and flows by gravity to the point of delivery, or is pumped through large pipes, kept afloat by pontoons. Another method is to load the spoil into transporter hoppers, tow these to a pump fixed to a floating pontoon, and pump ashore into embanked depressions.

**Dred Scott Case.** Slavery test case in the U.S.A. In 1848 an American negro slave named Dred Scott, belonging to Missouri, sued for his freedom on the ground that, having been taken by his master into Illinois and into the Louisiana Purchase, where slavery was prohibited, he had thus acquired the status of a freeman. The supreme court of Missouri held, however, that on returning to Missouri he had reverted to his original status, and thus had no standing. This decision was upheld by the supreme court of the U.S.A. in 1857. See Slave Trade.

**Dreiser, THEODORE** (1871–1945). An American novelist. He was born to German parents at Terre Haute, Indiana, Aug. 27, 1871, and spent his childhood in poverty. By the generosity of a woman teacher he was sent to the state university of Indiana, and became a successful journalist. His experience as a reporter in big American cities had an important influence on his work, for he saw life as a ruthless struggle for existence. Sister Carrie, 1900, with which he made his reputation, was full of a harsh

realism and revealed his materialistic outlook. His novels were of great length and lacked any attempt at literary style, but were notable for immense vitality and brutal observation. With *An American Tragedy*, 1925, he achieved wide popularity. Apart from novels he wrote autobiography, e.g. *A Traveller at Forty*, 1914; *A Book About Myself*, 1929. He died at Hollywood, Dec. 28, 1945.

**Dreissensia** or **ZEBRA MUSSEL.** Fresh-water bivalve mollusc common in many British rivers and canals. In shape it somewhat resembles a small boat, its name being derived from the stripes on its exterior. It attaches itself by a byssus (bundle of filaments) to wood or stone work and to shells. The name is taken from a Belgian physician named Dreyssen.

**Drenthe** or **DRENTE.** Province of the N.E. Netherlands. Its area is 1,029 sq. m. A sandy and marshy district, it is flat save in the N.E., where there is a ridge of hills. Potatoes are largely grown, peat is cut, and the coarser cereals are cultivated. Sheep, cattle, and pigs are reared. Several attempts have been made to reclaim and improve the land, and colonies for the latter purpose have been founded. Two or three of these have been successful, but the province remains in every way one of the poorest in the kingdom. Emmen, Assen, and Hogeveen are the largest towns. Pop. 261,098.

**Dresden.** The seventh largest German city, capital of Saxony, with a pop. of (1935) 625,174, (1946) 454,000, and an area of 42 sq. miles. It stands on both banks of the Elbe, 110 m. S. of Berlin. On the left bank of the river was the old town, on the right the



Dresden arms

new. Six impressive bridges linked them. For many years a very important industrial centre, the city was distinguished in appearance, comparatively quiet and well planned, hygienic and comfortable residentially. This was due mainly to the buildings put up and improvements made by electors and kings of Saxony, especially by Augustus II, the Strong (1694–1733), and his successors; and partly to the nature of Dresden's industries (cigarette and chocolate making, production of photographic, optical, and pharmaceutical materials, high-

class engineering, etc.). Even the factories were, to a considerable extent, so built as to fit into the ambitious architecture of Dresden. Something like 200,000 persons were employed in about 8,000 enterprises.

Dresden was also an outstanding seat of education. It had a technical university, a musical and theatrical high school, and an art academy. The boarding-schools of Saxony's beautiful capital attracted pupils of both sexes from all over the world; and, on account of its fine art galleries, it had a similar attraction for teachers and students of art.

#### Damage in Air Raids

During the Second Great War, Dresden was spared air attack until the night of February 13–14, 1945, when, in support of advancing Russian forces, the R.A.F. bombed it severely twice, the U.S.A. 8th A.F. heavily bombing it again next day. Six sq. m. of the inner town were left in ruins; thousands were killed (21,000 dead had been recovered from the ruins eighteen months later, and many still remained), for in addition to the town's wartime population of some 400,000, there were approximately 600,000 refugees from the E. The court church, a R.C. baroque building connected structurally with the palace, was half-destroyed; scarcely anything remained of the church of Our Lady (1726–43) with its beautiful dome 312 ft. high; the very impressive opera house (opened 1878) was burnt out; the Royal palace—16th century, much altered between 1889 and 1901—was devastated. The remarkable baroque Zwinger gallery was badly blasted; originally planned as a palace by Augustus the Strong, and connected with a Renaissance palace, it had before the war some of the finest collections in the world of paintings and engravings, ethnological, zoological, mineralogical, etc., collections. Its most famous picture, Raphael's *Sistine Madonna*, was transferred by the Russian occupation authorities to Leningrad in 1946. Plans for a new Dresden, to take twelve years in building, were made in 1946.

Dresden owed most of its classical buildings to M. D. Poeppelmann, Augustus's architect. Besides the Zwinger, the Japanese palace, the church of the Three Kings, and the Prinzen palace, its baroque buildings included the Cosel palace, the church of the Cross (renowned for its boys' choir), the church of S. Anne,

the old town hall, and the town hall of the new town, and these gave Dresden the rare homogeneity that was its distinctive beauty. A number of fine squares (the Theater, the Bismarck, the Albert, the Post, etc.), the old and the new market places, most of which have good monuments or statues, spacious parks, especially the "Great Garden," further embellished the city of the ambitious Saxon kings; the Brühl terrace, overlooking the river from a promenade with an approach adorned with allegorical figures, was a feature few towns had the physical situation to emulate.

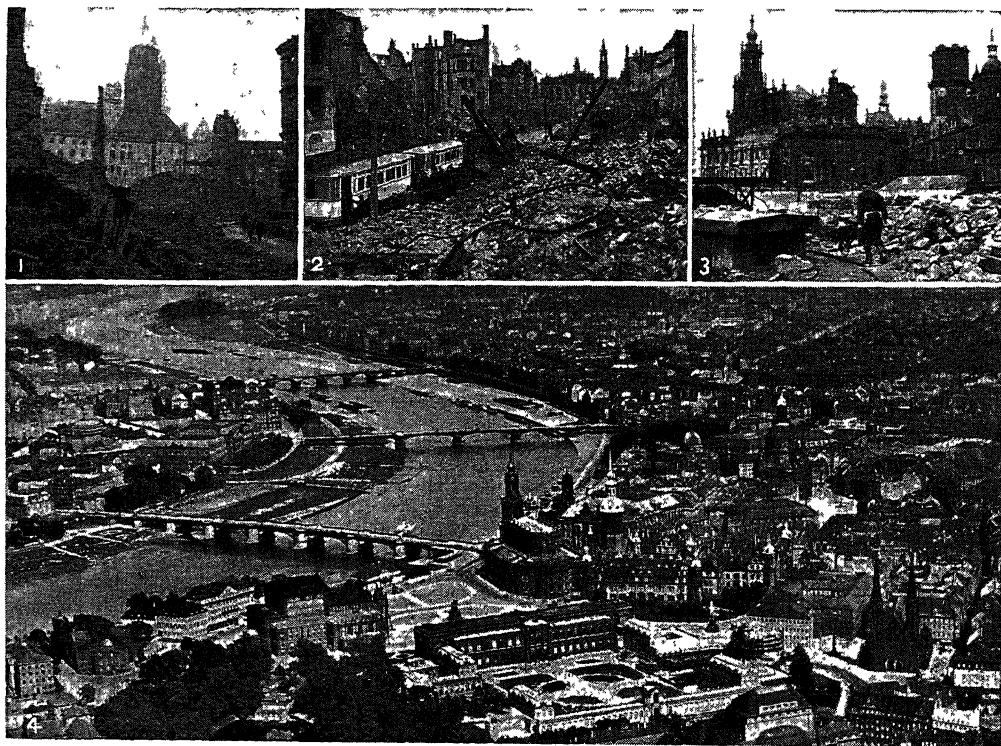
The royal collections were magnificent. In one wing of the Royal palace, in the so-called Green Vault, the crown jewels with other valuable specimens of jewelry and the goldsmiths' craft, as well as curios, were shown to the public; the museum of coins, the porcelain, the historical and many other museums contained valuable collections; the Albertinum, once the arsenal, held a rare collection of antiquities. There were houses devoted to the memory of the poet Theodor Körner, and of the

sculptor Johannes Schilling, and a whole range of modern buildings for the state and local government, some of them, like the new town hall, of merit.

The first settlement on the site of Dresden was a Slavonic fishing village, Drezdzane, guarded by a castle of the margraves of Meissen. A German town began to develop shortly after 1200; its first burgo-master was appointed in 1292, and in 1489 it had about 5,000 inhabitants. In 1485 it became the residence of the ruling family who, having introduced the Reformed church in 1539, started to build on a large scale, at first from the point of view of fortifying the town. Augustus II and Augustus III were, simultaneously, kings of Poland and electors of Saxony, and, trying to outdo other and greater sovereign courts in splendour, they gained for their capital the name of "Elbian Florence." Several disasters—e.g. a raging fire in 1685, and a bombardment by Frederick the Great in 1760—were exploited to improve the planning and building of the town. Dresden was the scene of a brilliant victory by Napoleon on Aug. 26–27, 1813. Its fortifications

were pulled down in 1817. Its economic development and its growth in size and population dated from that time.

**Dresden, BATTLE OF.** Victory of Napoleon over the allied armies, Aug. 26–27, 1813. The advance of the Austrian general Schwarzenberg upon Dresden caused Napoleon to hasten back from Silesia. At 6 p.m., Aug. 26, Schwarzenberg, after a heavy bombardment, sent six columns against the suburbs of the city. The assault was repelled by the French at every point, and as night approached the Austrians withdrew. All through the night, during which rain fell heavily, reinforcements were reaching Napoleon, and on the morning of the 27th he opened an attack on both flanks of the enemy. Murat and his cavalry were hurled against the left flank under Metzko and destroyed it, while Ney with the young guard made a violent attack against the right, composed of Russians. When night fell Schwarzenberg ordered a retreat. Napoleon put 96,000 men into the field, while the allied forces amounted to 200,000. The French lost 10,000 killed, wounded, and prisoners; the allies 38,000.



Dresden. Lower picture gives a general view of the city as it was. The three upper pictures show the devastation wrought by the Allied air raids of Feb., 1945. 1. Streets near the town hall (centre). 2. Workers leaving by special trams after a day's toil on the debris in the Johannstrasse, 1946. 3. Sorting debris in front of the ruined R.C. Cathedral (left), 1946

**Dresden China.** Ware made at Dresden and Meissen. In 1709 J. F. Bottger discovered the secret of making this kind of china, and the first was produced in the royal factory at Dresden. The name has remained, although the manufactory was transferred in 1710 to Meissen. The china is remarkable for the fineness of the body and the delicacy of colouring, maroon, apple green, canary yellow, and pale mauve grounds being introduced during 1720-40 in suc-

cession to the early blue and white, with under-glaze painting of flowers and figures. In 1731 Kandler began to model small and large figures and groups, busts and animals. In 1740 the rococo style of decoration prevailed and long persisted, while the figures were mostly of Arcadian shepherdesses and swains, cupids, etc. Large chimney-pieces, candelabra, tables, panels for cabinets, and mural decoration have also been made at Dresden. The mark is two crossed swords and a crown. See China Marks; Pottery.

**Dress** (Fr. *dresser*, to straighten). Anything worn upon the human body. Serving the purposes of equipment, ornament, and protection, its origin has been attributed to the belting of the waist by a pliant bough or a strip of hide for attaching the rudimentary equipment of primeval man. This invention would, in that event, follow the invention of tools, and early palaeolithic culture offers no evidence of more than this custom, still observable among aboriginal Australians. The waist-string, with its variants the leaf-girdle, the fringed belt, and the loin-cloth, is still the sole attire of many primitive peoples. Ornament, the second step in the direction of clothing, even when it served a protective purpose as well, developed under the instigation of religious and sexual psychology, including that form of self-consciousness which culminates in vanity.

The final phase, the clothing of the person, is essentially protective, whether against insects and other animate things, thorns,

rain, sun, cold, and other physical discomforts, the weapons of hostile man, or attacks upon the inviola-



Dresden China. Pair of figures representing flower and fruit sellers, brilliantly coloured, c. 1745. The pieces are  $5\frac{1}{2}$  ins. in height

bility of the person and the sense of modesty. This was in part the offspring, in part the originating cause, of dress. Some of these purposes were and still are fulfilled by body-painting, tattooing, and scarification. Leaf-aprons, an early development in tropical lands, survive in S.E. Asia; felted bark-cloth in Polynesia and equatorial Africa. The use of skins, widespread in Bantu Africa, Central Asia, and Arctic lands, exhibits local developments, as the Gilyak salmon-skin costume and the Aztec feathered cloak. In neolithic Eurasia plaiting and felting were followed by weaving, and this invention, applied to animal and vegetable fibres, was carried along the early cultural routes all over the world. See Costume.

**Dresser.** Fixture in a kitchen or pantry. It consists of a base with cupboards and drawers, a flat top, and a superstructure of shelves for holding plates and dishes upright. A development of the sideboard, dressers were originally side tables, whereon dishes were dressed for the table.

**Dressing.** In metallurgy, a process applied to ores preparatory to extracting the metal. While certain ores when brought up from the mine are in a condition ready for direct introduction into a furnace for smelting, the great majority are rarely in that state. They carry too large a proportion of worthless gangue—earthy or rocky material—and therefore require to be submitted to a preliminary concentration to separate as much as possible of the worthless material from the ore proper.

Sometimes hand breaking and picking over will be sufficient; but generally it will be necessary to crush and perhaps grind the crude ore. It will then usually be possible to effect a further concentration by mechanical means, taking advantage of the difference between the specific gravity of the worthless portions of the ore and those which are rich in metal. The principle adopted is to introduce the whole mass into water in motion, and to keep the mass agitated sufficiently to allow the water to wash away the lighter matter while the heavier, rich portion settles. This operation, termed dressing, is carried out in jigs or buddles.

Another method of wide application is flotation, in which the valuable constituents of the ore are made to float on a water suspension of fine ore. Air bubbles, becoming attached to the minerals, raise them away from the gangue. Dressing is sometimes used to include all the operations of sorting, picking, and otherwise concentrating the ore previous to the beginning of the heat or chemical treatment. Cleaning castings as they come from the moulds, that is removing gates, fins, and sand, in many districts called fettling, is more generally known as dressing. See Casting; Flotation.

**Dressings.** Fabrics employed for the protection of wounds or injuries. Cotton wool, which consists of hairs and seeds of various species of gossypium, contains about 10 p.c. of fatty material; when this is removed, it is called absorbent cotton wool. Bandages are made of buttercloth, calico, crêpe, domette, flannel, muslin, gauze, elastic rubber webbing, etc. Gauze tissue is prepared plain and also medicated with boric acid, iodoform, sulphonamide, mercuriozinc cyanide, and other antiseptics. Paraffin-impregnated gauze allows exuded matter to escape and does not stick to the wound. Lint can be medicated similarly. Collodion consists of a solution of pyroxylin in alcohol and ether, which when painted on the skin over small wounds rapidly evaporates so that a dry protective covering is left. Collodium flexile contains a small amount of Canada turpentine and castor oil, and makes a more elastic film than simple collodion. Sticking plasters consist of tenacious substances spread on one side of a fabric, and are used for application to the skin, to which they adhere. During the Second Great War the tendency was to use

dressings which could be left in place undisturbed. See Surgery.

**Dressing Station.** Medical aid post for treating casualties near the scene of action in war. Royal Army Medical Corps personnel operated advanced dressing stations which were established as close as possible to the fighting line, but behind the regimental aid posts. Wounds were dressed and minor or extremely urgent operations were performed at the dressing stations before the casualties passed to the Casualty Clearing Stations. In civil defence during the Second Great War the first aid posts acted as dressing stations. See Casualty Clearing Station; Royal Army Medical Corps.

**Dressler, MARIE** (1869-1934). Canadian film actress. Her real name was Leila Koerber, and she was born at Coburg, Ont., Nov. 9, 1869. She first appeared on the U.S. stage in 1886, and after a long and varied career became famous as a screen character actress in Tilly's Punctured Romance, 1914, when she appeared with Charles Chaplin. In her later films she frequently played opposite Wallace Beery (*q.v.*). Her autobiography, *The Life Story of an Ugly Duckling*, appeared in 1925. She died July 28, 1934.

**Dressmaking.** The art or occupation of making dresses. The term is generally used to signify the design, preparation, and manufacture of women's clothing, whether for indoor or outdoor wear. Most of the work carried on in large dressmaking establishments is specialised and offers a wide range of employment. The proprietors or directors of the business or their highly qualified assistants are often the designers of the dresses, and to be successful they must possess both original talent and technical knowledge. There are openings for apprentices, or trainees as they are now styled, who perform the simpler routine work. Then come the improvers and the assistants. The fully-trained hands are usually specialists in blouses, skirts, evening dresses, etc. The cutters and fitters are also specialised workers; and a large establishment employs in addition saleswomen and models or mannequins.

In the U.K. the method of instruction of the trainee has greatly improved since 1920, and closer cooperation exists between the industry and the various trade and art schools. In Feb., 1946, an advisory committee was set up by the L.C.C., composed of

representatives of the National Union of Tailors and Garment Workers and of the London Clothing Association's Education Committee (which organizations cover every branch of the trade), with a view to advising on the technical training of operatives for the clothing trade.

Needlework instruction is given in primary, secondary, and technical schools, and more advanced training by technical and art schools and polytechnics. In some schools courses combine technical with art subjects.

Girls from every walk of life become trainees, usually beginning when they leave school. Trainees are paid from the time they enter a firm's employment, their wage increasing as their training makes them more valuable. The training period in a house making model garments lasts about five years, and at the end of this time the trainee may be placed in charge of a workroom or be promoted to the status of fitter. The higher grade wholesale trade, which undertakes mass production on a large scale, employs far more people than do the houses making model garments. The training period with a wholesale firm usually continues for three years. Wages of fully trained competent operatives are good.

#### In the United States and France

In the U.S.A. a federal law prohibits the employment of any person under 16. There is no fixed period of apprenticeship in dressmaking; but there are state vocational or trade schools to which girls may go after completing their grade school education. In these trade schools there are courses of needlecraft, machine operating, designing, etc., combined with subjects that the trainee would have taken if she had continued her studies in high school. After the pupils have completed their training the schools endeavour to place them in employment. Most work in the garment industry is piece-work, with a guaranteed minimum and fixed rates. New York is one big centre of dressmaking in the U.S.; Chicago is another.

Dressmaking in France is largely confined to the *haute couture* of Paris; there is very little wholesale production. Trainees are not required to pay a premium, and the normal period of apprenticeship is three years. French law insists that any child beginning work at the age of 14 shall attend professional classes for at least three years. Junior trainees in

the fashion houses can attend free evening classes; while those who can afford to do so pay for courses at the *Chambre Syndicale* schools, some of which they attend in the evening, some by day in time granted by their employers. The course includes cutting, dress-making, the technology of fabrics, French, mathematics, domestic science, and general knowledge.

If the pupil in the free classes gains her certificate of professional aptitude, she may seek employment as a second hand. A paying pupil can begin her course at any age and receives a diploma (instead of the certificate of professional aptitude) upon successful completion of the three years' course. A girl who shows special merit is sometimes given a small grant by the *Chambre Syndicale*, if her family circumstances are difficult, to help her through her training. A pupil must hold the certificate or the diploma before she can undertake a further course of four hours a week for one year to prepare herself for the most advanced course of training, given in an *École Supérieure*, extending over two years, and preparing women for employment as workroom overseers, designers, and teachers in the technical schools. Considerable effort is made to attract girls to the industry.

**Dreux.** Town of France, in the dept. of Eure-et-Loir. It stands on the Blaise, 22 m. N. of Chartres. The finest building in the town is the magnificent *Chapelle Royale*, containing the tombs of the Orléans family. It stands on a hill overlooking the town and lies within the ruins of the old castle, and was finished by Louis Philippe, whose mother began it. The rotunda, the main part of the building, built in 1816, stands about 80 ft. high and is surmounted by a handsome dome 43 ft. in diameter. The stained glass and the stone sculptures are specially noteworthy. The *hôtel de ville* is a fine, large building of the 16th century. The Gothic church of S. Pierre, dating from the 13th to 15th centuries, has some fine stained windows, and a richly wrought organ-case of the early 17th century by a local designer, Clément Métézan. Dreux is a market town for agricultural produce, and has tanneries and manufactures of boots and shoes. In the Middle Ages it was the stronghold of a powerful line of counts. It was several times besieged, notably in 1593, when Henry IV captured it from the Catholic League and

destroyed the castle. The Germans took it in 1870. Pop. 14,184.

The battle of Dreux was the first serious encounter in the religious wars of France. It took place on Dec. 19, 1562, between the Roman Catholics under Montmorenci, the constable of France, and the Huguenots under Condé. The Huguenots could not overcome the resistance of the trained foot soldiers opposed to them, and after a stubborn struggle they fell back in good order under the direction of Coligny. Both Condé and Montmorenci were taken prisoner.

**Drevet**, PIERRE JOUBERT (1697-1739). French engraver. A son of Pierre Drevet, engraver to Louis XIV, he was born at Paris, and studied with his father. His most famous engraving is the portrait of Bossuet, executed in 1723, after the portrait by Rigaud. His religious subjects are also notable. He was insane for the last nine years of his life.

**Drewenz**. River of Poland. A right bank tributary of the Vistula, it flows S.W. to join this river above Torun (Thorn). Almost the whole of the lower Drewenz once formed the frontier between Germany and Poland. In length about 150 m., the river drains the W. end of the Masurian lakes district.

**Dreyer**, CARL (b. 1889). Danish film director. He was born Feb. 3, 1889, and became a journalist and art critic. He then wrote film scenarios, directing his first picture, *Praesidenten*, in 1918. During the next ten years he worked in Germany, France, and Scandinavia, where he was regarded as one of the most prominent European directors. Dreyer never attempted to create popular films; he experimented in psychological pictures and his technique was bold and masterly in its economy, a favourite device being that of an extended use of close-up. His finest productions included *Jeanne d'Arc*, 1923; *Vampire*, 1930 (based on *le Fanu's In a Glass Darkly*); and *Day of Wrath*, 1943.

**Dreyfus Case**. Miscarriage of justice in connexion with Alfred Dreyfus (1859-1935), a captain of artillery in the French army. In Dec., 1894, Dreyfus was sentenced by a court martial, on the charge of telling French military secrets to the German government, and then, under a special law made for the occasion, imprisoned on Devil's Island. He had meanwhile, Jan. 4, 1895, been publicly degraded. The published evidence

appeared defective, and there were strong suspicions that the court martial had been biased by the fact that Dreyfus was a Jew.

The supposed proof of his guilt was a document declared by experts to be in Dreyfus's handwriting, describing information which the writer proposed to place in the hands of a German military attaché. Eighteen months later, Colonel Picquart, a new head of military intelligence, satisfied himself that the document had been written not by Dreyfus, but by Colonel Esterhazy, an impecunious adventurer. Picquart submitted his discovery to his chiefs, Generals



Alfred Dreyfus,  
French soldier

Gonse and Boisdeffre. They declined to take action, apparently on the ground that, since the French war office had been responsible for the trial, the credit of the army and the department would suffer if a fresh inquiry were instituted. A true charge was then brought that the court martial had given its judgement illegally on the strength of evidence secretly laid before it but never submitted to the accused or to his counsel. A fierce newspaper war followed. It became impossible to avoid a court martial on Esterhazy, when fresh evidence was produced that the document was in his handwriting. Nevertheless, Esterhazy was acquitted on Jan. 11, 1898, the judges having refused to admit any reopening of the *chose jugée*.

#### Zola's Spirited Championship

Emile Zola, the novelist, who was supported by Clemenceau, then wrote the public letter called *J'accuse*, charging the government officials with having lent themselves to a deliberate conspiracy for the destruction of Dreyfus, and with now refusing justice in order to shield themselves from disgrace. For this Zola was prosecuted and heavily fined. The *cour de cassation* courageously quashed the proceedings; but on a new trial Zola was again condemned (July 18). Then a member of the intelligence department, Colonel Henry, was forced to confess that he had himself forged certain leading documents in the case, was arrested, and was immediately afterwards (Aug. 31) found in prison with his throat cut. Esterhazy fled from France, and made public some

contradictory "confessions" of his own guilt.

By this time the whole of France was expressing views on the case, often violently partisan, counter-charges of anti-Semitism and anti-militarism being freely directed against public figures.

A revision of the trial could no longer be refused, and in 1899 a fresh court martial was held on Dreyfus at Rennes. This court again pronounced him guilty, though "with extenuating circumstances," on Sept. 9, and condemned him to ten years' imprisonment. This further injustice was, however, prevented by President Loubet granting him a formal pardon. Some years afterwards the *cour de cassation* reopened investigations, and on July 12, 1906, declared the innocence of Dreyfus, who was thereupon restored to the army and promoted. Picquart, who had steadily believed in his innocence and been degraded, was likewise promoted. Dreyfus received the Legion of Honour in 1919. He died July 12, 1935, the anniversary of his rehabilitation 29 years before.

There is a large literature, much of it inconclusive, on the case. A film of Dreyfus was made in 1931, Cedric Hardwicke taking the part, and the case was prominently treated in the film *Life of Emile Zola*, 1938, Joseph Schildkraut playing Dreyfus to Muni's Zola.

**Dreyse**, JOHANN NIKOLAUS VON (1787-1867). German inventor. Born at Sömmerda, Prussia, Nov. 28, 1787, he was interested in firearms, and in 1809-14 was employed by Napoleon at Paris. In 1827 he invented the muzzle-loading needle-gun, and in 1836 the breech-loader, an important factor in the rapid victory of Prussia over Austria in 1866. He died at Sömmerda, Dec. 9, 1867.

**Driffeld** or GREAT DRIFFIELD. Market town and urban district of the East Riding of Yorkshire, England. It is a local railway junction 20 m. N.N.W. of Hull, with which it is also connected by a canal, now disused. The church of All Saints has a 15th century tower. This principal town of the Yorkshire wolds is the centre of a large agricultural district; its chief industries concern flour milling, agricultural implements, and sugar refining. Cattle market, Tues.; corn market, Thurs. Driffeld aerodrome was one of the first attacked by German bombers in the Second Great War, July 4, 1940, and was virtually destroyed Aug. 15. Pop. 6,300.



**Drift.** Sheets of sedimentary deposits resulting from the action of floods or rivers which once issued from the melting end of a glacier or ice sheet, hence the more technical term, fluvio-glacial deposits. These deposits are composed of clay, stones, and sand, and thus their composition may be compared with that of moraines. Drift was also deposited as the ice melted without necessarily being transported by rivers. Much of the drift, which covers large areas of England, is a stiff clay, known as boulder clay or till, in which soil the finest crops of wheat are grown. *See* Geology; Glacier.

**Drift.** In aeronautics, the lateral motion of an aircraft to a side wind. To assist in navigation the drift of an aircraft is computed by a drift indicator. In ballistics, drift is the continual deflection of a projectile from the plane of departure due to reaction between the air and the projectile's rotary motion. Drift is to the firer's left in projectiles fired from rifled arms with left-handed rotation.

**Drift and Solid Map.** Two classes of map published by the geological survey of England and Wales. Solid maps show the distribution of the solid rock formations; drift maps the superficial deposits of clays, sands, etc., which have been spread over them by the work of ancient glaciers and ice sheets. On the drift maps the solid rock formations are coloured only in those places where no drift is present. In those parts of England where the superficial drift deposits are of considerable thickness and widely distributed, no solid maps are issued. In E. England, S. of Scarborough, the drift editions are more useful in matters relating to water supply, agriculture, etc., but for mining purposes the solid editions for most areas are more valuable. *See* Map and Map-making.

**Drifter.** Small vessel about 100 ft. long, used in the herring fisheries, and so called because it drifts its nets and does not pull them. During both Great Wars large numbers of drifters were employed on barges, patrols, and in netting channels against submarines. *See* Dover Patrol; Fisheries; Trawler.

**Drifting.** In metallurgy, a ductility test for copper and brass tubes or pipes. The material must withstand drifting or bulging without evidence of either cracks or flaws until the diameter of the bulged or drifted end measures not less than 25 p.c. more than the

original diameter of the tube. This test is a standard inspection test embodied in specifications of the British Standards Institute and the Air ministry.

**Drift Net.** Net of a fine mesh which is kept stretched out by corks on the upper edge, and by lead weights on the lower. The net is made to move through the water parallel with shoals of such fish as herring, mackerel, or pilchards, in such a way that when these fish leave the inshore waters they run into the nets and are caught by their gills and suffocated. For herring the net may be as long as 120 yds.; for mackerel one of about 60 yds. is used. *See* Fisheries.

**Drill** (*Cynocephalus leucophaeus*). Large baboon found in W. Africa. It closely resembles the mandrill, but lacks the red and blue colouring of the face, which in this species is jet black. It is savage and morose in captivity, but little is known of its habits in the wild state. *See* Mandrill.

**Drill.** Exercises in which a body of men is taught to act in perfect unison, either for physical development or for the execution of various movements, at various paces and in various formations, by signal or word of command. Soldiers are also taught to keep time in the handling of their weapons, to keep step in marching, and to salute.

Gradually all these cadenced actions become mechanical, so that by a word an officer can set the military machine in motion or bring it to rest. A well-drilled body of troops moves "like one man," and this subordination of mind and muscle aids discipline, though in excess it tends to destroy initiative.

The system of drill prescribed for the British army was first laid down by Sir David Dundas in *Principles of Military Movements*, 1788, 2nd. ed. 1795; it was modified in 1824 by Sir Henry Torrens in his *Field Exercise and Evolutions of the Army*. The drill in threes, instead of fours, was introduced in 1937. *See* Battle School; Physical Training.

**Drill.** Agricultural implement for sowing. The earliest method of sowing cereal seed was to distribute it broadcast on the surface of the soil by hand. There were serious drawbacks to this procedure: (1) the seed was covered indifferently, much of it failed to grow, and it was always subject to the depredations of birds; (2) it grew from various depths and thus

unevenly; (3) owing to the irregular spacing of the plants, it was impossible to cope efficiently with weeds. From Babylonian times efforts were made to provide some form of machine which would deposit seed at regular depths and with adequate cover of soil.

The true precursor of the drill as it is known today was Jethro Tull's invention in 1701. The essentials of this drill were a series of fixed coulters drawn through the soil at a regular depth, a seed-box and dropper unit which fed the seed into the coulters, the whole being operated from two large running wheels, and horse-driven. Corn sown with this machine thus grew in regularly spaced rows and provided opportunity for weeding the crop; it required less seed and produced greater evenness in the crop. The Hornsby-Leake drill went a stage further by spacing the individual seeds. Drills are adapted to sowing agricultural and horticultural seeds of all descriptions; all are based on Tull's original ideas.

**Drill** (Dutch *drillen*, to bore). Mining tool. Rock drills operated by compressed air are percussion tools, used for breaking rock and making shot holes in mining, quarrying, and tunnelling. Similar tools are used extensively in demolition work and for repairs to roads and pavements.

The drilling action of a pneumatic rock drill is the same as when drilling rock by hand, the drill or chisel being given a sharp blow by a hammer, and then twisted slightly before the next blow is delivered. A small piston driven forward by compressed air acts as the hammer, whilst a valve, also actuated by compressed air, governs the movement of the piston. Rotation is obtained by causing the piston to move over splined rods associated with ratchet gear. Hollow drill steel is used to permit wet drilling, and the cutting edge is of various forms—chisel, cross, rose bits, etc. An average medium drill works at about 1,800 strokes a minute.

Other machines for drilling in rock are the diamond drill and the shot drill. *See* Boring; Mining; Quarrying; also illustration under Diamond.

**Drill** or **DRILLING** (Ger. *Drillich*, Lat. *trilix*, triple-threaded). Strong linen or cotton fabric used to make suits for wear in the tropics. Khaki cotton drill is worn by troops on service in hot climates. The pattern is a twill, often of a round, screw-like

diagonal, and the tightly twisted warp yarn is predominant upon the surface. Cotton drills are used for pockets and frequently for corset making and other purposes for which strong stuff is required.

**Drim.** River of Albania. It is formed by the union, at Kula Liamu, of the White Drim, rising in the Shar Dag, and the Black Drim, issuing from Lake Ochrida—both these sources being in Yugoslavia—and flows into the Adriatic below Alessio, after a course of 110 m. Anciently it was known as the Drilo or Drilon. During the First Great War the gorges of the two streams and of the main river were traversed by the Serbians in their retreat to the sea in 1915.

**Drina.** River of Yugoslavia. It rises near Sirovac among the mts. of Montenegro in several headstreams, the chief of which is the Tara, and flows N., N.W., and then N.E. to effect a junction with the Save, 58 m. W. of Belgrade. The principal of its many affluents is the Lim. Its length is 160 m.

The battle of the Drina between the Austrians and the Serbians in the First Great War, began Sept. 8, 1914, with the Austrian crossing of the river in their second invasion of Serbia. The critical fighting took place among the mountains S. of the Jadar. By Sept. 11 the Austrians held Shabat, while the Sokolska Platinas as far as Petska was in their hands. On Sept. 14 the Serbians, who had been reinforced from the N., attacked the Guchevo heights and carried Kulishte. Southward, on Sept. 16, the Serbians stormed the summits of the Sokolska, and drove the enemy in disorder to the river. Finally both sides, being exhausted, settled down to trench warfare. See Serbia, Conquest of.

**Drinkwater, JOHN** (1882-1937). English dramatist and poet. He was born at Leytonstone, June 1, 1882, and educated at Oxford high school. One of the founders of the Pilgrim Players which developed into the Birmingham repertory theatre, he maintained a lifelong interest in the stage, although for 12 years an insurance clerk. His first play, *Cophetua* (1911) was in verse; his most successful was *Abraham Lincoln* (1918), followed by others in the same historical style, *Mary Stuart*, *Oliver Cromwell*, *Robert E. Lee*. *Bird in Hand* (1928) was a charming village comedy, like



John Drinkwater,  
English dramatist

and a volume *Summer Harvest* (1933) showed him at his happiest with Cotswold subjects; and he turned out topical verse of a high order for national and theatrical occasions. *Inheritances and Discovery*, both autobiographical, appeared 1931-32. As an actor he played Lincoln in his own play of that name and the king in *Henry IV*, part 1. He died March 25, 1937.

**Driestone.** In architecture, the projecting tablet or moulding on the crown of an arch, window, or doorway. See Moulding.

**Driscoll, JAMES** (1880-1925). British boxer. Born at Cardiff, Dec. 15, 1880, he had more than 50 victories to his credit. He secured the feather-weight championship in 1910, and became the winner outright of the Lonsdale belt for that weight. His two defeats were by Harry Mansfield in 1904 and by Freddy Welsh to whom he lost on a foul in 1910. "Jem" Driscoll announced his retirement from boxing after his drawn battle with O. Moran, Jan. 27, 1913. He died Jan. 30, 1925.

**Driver.** The longest club in a golfer's outfit, with a wooden head and almost straight face, used for tee shots. The beginner should learn to drive with a brassie, and when he can use that club successfully should procure a driver with a similar lie and of equal length to the brassie. Only when the ball "sits up" well is it possible to use the driver through the green. The driver, with the other clubs commonly used in the game, is illustrated in the article on Golf.

**Driver, SAMUEL ROLLES** (1846-1914). A British Biblical scholar. Born at Southampton, Oct. 2, 1846, he was educated at Winchester and New College, Oxford.

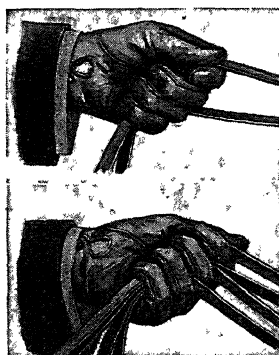
*Abraham Lincoln* often revived. In prose Drinkwater wrote *The Pilgrim of Eternity*; *Byron, a Conflict* (1925); *Life of C. J. Fox* (1928). His collected poems (1923)

A member of the O.T. revision company, 1876-84, he was regius professor of Hebrew and canon of Christ Church, Oxford, from 1883 until his death, Feb. 26, 1914. One of the greatest Hebraic scholars of his time, Driver collaborated with F. Brown and C. A. Briggs in editing *A Hebrew and English Lexicon of the Old Testament*, 1906 (based on E. Robinson's translation of the work of F. H. W. Gesenius). His *Introduction to the Literature of the Old Testament*, 1891, aroused much controversy, but is now generally held to reconcile the higher criticism of the O.T. with a sincere belief in its inspiration and religious authority. His other works include *A Treatise on the Use of the Tenses in Hebrew*, 1874; a revised translation of *Jeremiah*, 1906; *The Parallel Psalter*, 1898; *Modern Research as Illustrating the Bible*, 1909.

**Driving.** Controlling and guiding a horse or horses harnessed to any vehicle. The British have always excelled as whips, as is shown by the records of the Brighton road in the times of the Regency and of the coaching period of the 18th and early 19th centuries. But since, except for short distance commercial hauls, in modern times mechanically propelled have displaced horse-drawn vehicles, driving has become little more than a pastime. Driving a car is considered under *Motoring*.

In driving a single horse the reins should be taken in the left hand, the left or near side rein being held between the forefinger and thumb, and the off-side or

right-hand one between the second and third fingers. The arm should be held at almost a right angle across the body, with the hand about 6 ins. in front of the bottom button of the waistcoat; this will enable the right hand to be easily used when it becomes necessary to employ both hands. In driving a pair, the reins are held in the same manner, but since there are



Driving. How reins should be held when driving a four-in-hand. Top, grip for single reins

two horses to control instead of one the task is more difficult as they may not pull equally. It is impossible to give in words an adequate description of the correct



Drogheda. S. Lawrence Gate on the N. side of the town; it is believed to date from the 12th century

manipulation of the reins in driving tandem or four-in-hand; instruction and practical illustration should be sought from an expert. Tandem, the driving of two horses, one in front of the other, attached to a dogcart, was once greatly favoured, but is now seldom seen except at horse shows.

The term "hands," of which the novice will hear much discussion, implies the exact weight or pressure put upon a horse's mouth in guiding him and the give and take of the driver's hand or hands to the pull of the horse. This is more often a gift than an acquirement. *See Coaching; Horse.*

*Bibliography.* Hints on Driving, C. S. Ward, 1870: Driving, 8th Duke of Beaufort, 4th ed. 1894 (in Badminton Lib.); Driving, F. M. Ware, 1904.

**Driving Band.** Term applied in ballistics to a band of relatively soft metal fixed near the base of a projectile of large calibre. The calibre of the driving band is slightly greater than that of the bore, so that when the piece is fired the band is bitten into by the lands, this making the projectile rotate. The band also acts as a gas check. As a rule it is fitted as close to the base of the shell as is consistent with the strength of the metal to resist the tearing off of the base of the shell. *See Shell; Windage.*

**Droeshout,** MARTIN (fl. 1620-51). English engraver. Probably of Dutch extraction, he came to reside in England before 1623, in which year was published his frontispiece portrait of Shakespeare in the first folio edition of the Comedies, Histories, and Tragedies. Among other portraits engraved by him were those of John Foxe, the martyrologist, and John Donne, dean of S. Paul's.

**Drogheda.** Mun. bor., seaport, and market town of co. Louth, Eire. It stands on the Boyne, 4 m. from Drogheda Bay, and 32 m. N. of Dublin by rly. It has a good harbour and a brisk trade in cattle, sheep, and agricultural produce; linens, cottons, beer, and artificial fertilisers are manufactured. Salmon from the river are sold. Market day, Sat. Pop. 15,180. In 1649 Cromwell entered the town and massacred its defenders; and it was surrendered by James II in 1690. *Pron.* Droïda.

**Drogheda Bay.** Bay on the E. coast of Eire, adjacent to the counties of Louth, Meath, and Dublin. From Clogher Head in the N. to the Skerries in the S. the distance is 25 m. The estuary of the river Boyne forms a deep indentation useful for coastwise shipping.

**Drohobich** (Pol. Drohobycz). Town of Ukraine S.S.R., 40 m. S.S.W. of Lvov. It is connected with that town by rly. and is a junction for lines to the neighbouring oil wells at Boryslaw. Oil refining is the chief industry. Drohobich has a fine Gothic church. The pre-war pop. was 32,622, including many Jews.

**Droitwich.** Mun. bor. and market town of Worcestershire, England. It stands on the Salwarpe, 5½ m. N.E. of Worcester and 126 m. N.W. of London, and is served by two rlys., while a canal connects it with the Severn. It is a market for agricultural produce. The chief industry was once the production of rock salt, but Droitwich is now chiefly known as a watering-place. Its brine springs, known to the Romans, have radioactive properties and are efficacious for rheumatism, neuritis, gout, etc. There are fine baths, hotels, etc., for visitors, and a public park. Droitwich has two old churches. S. Andrew's and S. Peter's. In the older part of the town the ground has subsided a good deal owing to the pumping out of the brine. Just outside is one of the principal transmitters of the B.B.C. Droitwich became a corporate town in 1554, and is governed by a mayor and corporation. Market day, Fri. Pop. 4,553.

**Drôme.** Département of France.

It lies in the S.E. of the country and has an area of 2,532 sq. m. It is a mountainous region, especially in the Alpine E. The Rhône forms its western boundary, while the Isère, the Drôme, and other tributaries also drain it. Agriculture is the chief industry. Wheat is grown in the valleys, especially in the fertile district of Valloire. Vines are widely cultivated, and olives, figs, and mulberries are important crops. Silkworms are largely produced. Many cattle are reared on the extensive uplands. Valence is the capital and other towns are Die, Nyons, Crest, Romans, and Montélimar. It is divided into four arrondissements, and before 1790 was partly in Dauphiné and partly in Provence. Pop. 267,731.

**Dromedary.** In zoology, the one-humped camel (*Camelus dromedarius*) of Arabia and N. Africa. In common speech the term is used for riding camels as distinguished from the heavier baggage animals. The late Latin name *dromedarius* (classical form *dromas*) comes from Gr. *dromas*, running. *See Camel.*

**Dromio.** Name of two comic characters, twin brothers, in Shakespeare's *The Comedy of Errors* (*q.v.*); and, by extension, a nickname for a twin.

**Dromore.** Urban dist. and mkt. town of co. Down, N. Ireland. It stands on the Lagan, 17½ m. S.W. of Belfast by rly. An ancient town, Dromore was formerly the seat of a bishopric, which was united to Down and Connor in 1842. Both town and cathedral were destroyed during the insurrection of 1641; the present church contains the tomb of Bishop Jeremy Taylor, its builder. There are castle ruins and a large Danish encampment. Linen is manufactured. Market day, Mon. Pop. 2,229.

**Drone.** Name given to the male of the honey bee. It is recognized



Droitwich, Worcestershire. Interior of large brine swimming bath

by its stouter build, broader head, and larger eyes than those of the queen or workers, and is stingless. It does not work, and its only function is to fertilise the queen. At the beginning of autumn all the drones in the hive are killed or driven out to starve by the workers. *See* Bee.

**Drone.** In music the pipe or pipes, in instruments of the bagpipe class, on which the sustained and unaltering bass tones are produced. The melody pipe is called the chanter. *See* Bagpipe; Chanter.

**Drone-fly.** Large fly (*Eristalis tenax*), so called on account of its close resemblance to a drone bee. It is common on flowers, and its larva, or rat-tailed maggot, lives in muddy water rich in decaying organic matter.

**Drood Controversy.** Name given to arguments concerning attempts to solve the problems raised by Dickens's unfinished novel *The Mystery of Edwin Drood* (q.v.). The uncompleted mystery plot has fascinated many men of letters, among them Andrew Lang, Sir W. Robertson Nicoll, and G. K. and Cecil Chesterton. In the fragment of text Drood was ostensibly murdered by his uncle, Jasper; and the mysterious Datchery, obviously disguised, was equally obviously working to bring home the guilt to the murderer. In 1887 Richard Procter, in *Watched by the Dead*, put forward the theory that Drood was not murdered, but was disguised as Datchery. J. Cuming Walters, in *Clues to the Mystery of E. D.* (1905) adduced evidence to prove that Drood was dead and that Datchery was a woman character, Helena Landless. The controversy may be said to have started from that point, in many books and countless articles, continuing intermittently ever since. Datchery has often been identified with at least two other prominent characters, Tartar and Bazzard; and opinion is likely to remain divided as to whether Drood escaped or perished. A high light of the controversy was a mock trial staged in London in 1913, in which John Jasper was arraigned for the murder of Edwin Drood before G. K. Chesterton as judge and a jury of distinguished literary men with G. Bernard Shaw as foreman. There was a suggestion that this might help to settle the problem for good, but Shaw destroyed all hope of such a result by facetiously

returning a verdict of manslaughter.

**Drop.** Term in ballistics to denote the amount of fall or drop from the horizontal line of fire of a projectile over a given range: the vertical distance between line of departure and trajectory at target range. Drop increases with range, and with a .303 rifle or machine-gun is as follows: 3.1 in. at 100 yds.; 14.4 at 200 yds.; 35 in. at 300 yds.; 67 in. at 400 yds.; 115 in. at 500 yds.; 167 in. at 600 yds. The term drop is also applied to the distance between the comb of the butt of a firearm and the top line of the barrel.

**Drop-Forging** OR STAMPING. A process of forging with two dies, a stationary die attached to an anvil block and a second die fixed to a tup which drops under gravity against the lower die. The dies are recessed so that when placed together they represent the shape of the completed article formed when steel at a sufficiently high temperature is hammered out between them. The process justifies expenditure when a large number of components of identical dimensions and design is to be produced. For parts of simple construction, one pair of dies may prove sufficient. *See* Forging.

**Dropmore.** Hamlet of Buckinghamshire, England. It is 4 m. N.E. of Maidenhead, and 2½ m. from the railway station at Bourne End. Dropmore is famous for the mansion and grounds here. The gardens, among the most extensive and remarkable in England, include an Italian garden and a pinetum. They were laid out, 1801-05, by Lord Grenville, later prime minister. The Dropmore Papers, published by the Hist. MSS. Comm., contain political correspondence of the time of Grenville.

**Dropped Wrist.** Condition in which the extensors of the hand, i.e. the muscles which bend the hand backwards, are paralysed, and when the arm is raised the hand hangs loosely and helplessly downwards. It may be due to injury or disease of the nerves supplying these muscles, and is not infrequently a symptom of chronic lead poisoning. Treatment depends upon the cause, the outlook for recovery being better when it is due to

injury than when it is the result of disease.

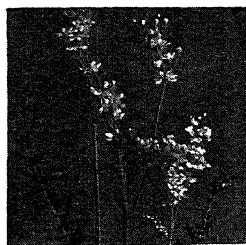
**Dropsy** (Gr. *hydrōps*, from *hydōr*, water). Accumulation of fluid—the watery part of the blood—in the tissues and cavities of the body. Dropsy arises in conditions which impede the normal circulation of the blood and increase the pressure in the vessels, causing fluid to transude through their walls. The commonest conditions giving rise to general dropsy are disease of the heart, kidneys, and liver. Localised dropsy, or *oedema*, may result from local weakness of the vessels, as in varicose veins.

Dropsy is generally first noticeable in puffiness of the eyelids, and in swelling of the ankles. If the swollen tissues be pressed with the tip of the finger, a small depression is produced which persists for a brief interval. In more advanced cases fluid collects in the abdominal cavity, producing the condition known as *ascites* (q.v.), which sometimes leads to great distension of the abdomen. Accumulation of fluid in the lungs causes a "waterlogging" of the organs which may bring about difficulty in breathing, and lead to a cough.

Treatment must be directed towards the underlying cause of the condition, but frequently great relief is afforded by measures which drain the body of fluids, such as the administration of diuretics to stimulate the flow of urine, and of purgatives which cause copious watery evacuations. In severe cases of accumulation of fluid in the abdomen or pleural cavities, tapping may be necessary.

**Drop Test.** In metallurgy, a shock test to a finished component. It is allowed to drop from a specific height on to a base, and should not fracture. A locomotive tire is caused to fall freely, in a running position, from a height depending upon its diameter on to a rail fastened to an iron block of not less than 2 tons. The tire is then turned through 90° and dropped a second time. Such tests are also used to prove the soundness of steel castings.

**Dropwort** (*Spiraea filipendula*). Perennial herb of the family Rosaceae. A native of Europe, N. Africa, and N. Asia, it is a plant of downs and dry pastures. It has an erect, grooved stem, 1-2 ft. high. The leaves are chiefly from the



Dropwort. A perennial herb common on downland

rootstock, broken into many pairs of deeply-toothed leaflets. The small, but numerous, white flowers are rosy on the outside, and borne in panicles.

**Droseraceae** (Gr. *droseros*, dewy). Family of perennial herbs, of wide distribution in marshy places. It consists of five genera and about 100 species. The flowers possess five sepals, a similar number of petals, generally five stamens, and 2-5 styles. They are all insectivorous, catching their prey by various means and digesting the bodies, upon which they mainly subsist. All have poor roots—in one species there is none at all. See Sundew; also Bog Plants illus.

**Droshky.** Russian word meaning a little wagon. A droshky is a light carriage on four wheels and without a covering. The first droshkies were formed of a board

until it is converted into oxide or litharge. The temperature is not allowed to rise sufficiently high to melt the litharge. What in effect is done is, to use the works' term, to convert the lead into a dross. See Lead.

**Droste - Hülshoff, ANNETTE ELISABETH, BARONESS VON** (1797-1848). German poet. Born at Hülshoff, near Munster, Jan. 10, 1797, she came under the influence of her cousin, afterwards archbishop of Cologne. Her principal works are *Poems*, 1838; *The Spiritual Year*, 1851; these entitling her to foremost rank among German women poets. She died at Meersburg, on Lake Constance, May 24, 1848.

**Drouais, FRANÇOIS HUBERT** (1727-75). French portrait painter. Born at Paris, Dec. 14, 1727, he studied under his father, Hubert Drouais, a miniature painter, Van Loo, Boucher, and Natoire. He became an academicien in 1758; and a little later painter to the court. Notable portraits by him are those of the Pompadour (at Orléans) and the Comte d'Artois (Louvre). He died Oct. 21, 1775.

His son, Jean Germain (1763-88), also a painter, born

at Paris, Nov. 25, 1763, studied with his father and with J. L. David (*q.v.*). In 1784 he won the prix de Rome with his *Woman of Canaan* at the Feet of Jesus Christ, and in 1785 accompanied David to Italy. He died at Rome, Feb. 13, 1788.

**Drouet, JEAN BAPTISTE, COMTE D'ERLON** (1765-1844). French soldier. Born at Reims, July 29, 1765, he entered the army as a private in 1782, and had risen to the rank of brigadier-general by 1799. He played a prominent part at Jena, 1806, and in the closing stages of the Peninsular War. Imprisoned in the citadel of Lille for alleged complicity in an anti-Bourbon conspiracy, when Napoleon returned from Elba in 1815 he escaped and seized and held the citadel for his old master. After the Waterloo campaign, in which he took part, Drouet went into exile, but returned to Paris in 1825. In 1834-35 he was governor of Algeria, and in 1843 was made a marshal. He died at Paris, Jan. 25, 1844. He must not be confused with the revolutionary Jean Baptiste Drouet (1763-1824),

who stopped the flight of Louis XVI to Varennes in 1791, and later, in the convention, voted for the death of the King.

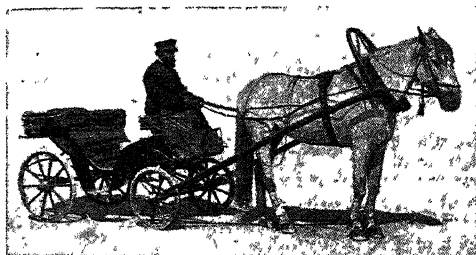
**Drought.** Spell of dry weather sufficiently prolonged to cause serious deficiency in the supply of water. To obtain comparative statistical information, however, certain limiting definitions have been adopted, and to meteorologists absolute drought means 15 consecutive days with rainfalls less than .01 in.; partial drought is 29 consecutive days with mean rainfall less than .02 in.; and a dry spell implies 15 days running with no rainfall above .04 in.

Countries which normally receive most of their rain at one season often suffer from droughts in the dry months. The countries bordering the Mediterranean, and those in similar latitudes on the W. of continents, whether N. or S. of the equator, *e.g.* California and central Chile, have most rain in winter and droughts in summer. Conversely the monsoon type of climate, as in India, brings wet summers and droughty winters. In the British Isles drought is possible in any month but never likely. Entire months have been rainless at several places; in 1944 there was no rain at Sidmouth, Feb. 16-March 31, a triple drought. The type of pressure distribution largely determines the incidence of rainfall or drought. See Climate; Weather.

**Drouyn de Lhuys, ÉDOUARD** (1805-81). A French statesman. Born in Paris, Nov. 19, 1805, he entered the diplomatic service and was employed in the embassies at Madrid and The Hague. In 1840 he became chief of the commercial department in the ministry of foreign affairs but, going into opposition, he lost his place. By Louis Napoleon he was appointed minister of foreign affairs in 1848, and during 1849-51 he was ambassador in London, returning to Paris to be foreign minister. He resigned in 1855, but held the portfolio again 1863-66. On the downfall of Napoleon III in 1871 he took refuge in Jersey. He died in Paris, March 1, 1881.

**Drover.** Variant form of driver, restricted to drivers of sheep or cattle. Before the coming of railways a large class of men in the U.K. was engaged in this occupation, making long journeys on foot with the cattle. See Cattle.

**Drowning.** Death from asphyxia owing to submersion of the mouth and nostrils in water or other fluid. Sometimes shock



**Droshky.** Light vehicle, once the commonest type of hired vehicle in Russian towns

placed across two pairs of wheels, enabling the passengers to sit sideways, as in an Irish jaunting car.

**Drosophila.** Generic name of a small fruit fly, *D. melanogaster*, notable for the ease with which it can be reared generation after generation, and on which much generic work has been done in connexion with the study of heredity.

**Dross.** Impurities formed and separating to the surface of a molten metal or alloy. This dross, or scum, usually consists of oxides formed by contact with the atmosphere and must be removed by skimming to render the metal fit for casting. In certain instances, however, the metal contained in dross can be recovered by the use of fluxes or deoxidisers.

**Drossing Oven.** Furnace used in the manufacture of red lead. In that process pig lead is melted in a low-arched furnace that has a bed formed of firebricks supported on a cast-iron base and provided with openings for introducing the fuel and the metal. The molten metal is rabbled about in this furnace and thus exposed to air

or syncope, caused by sudden immersion in cold water and the state of terror experienced by the individual, combines with asphyxia in causing death. The number and causes of civilian deaths from drowning in England and Wales in 1943 were as follows:

	Accident or Negligence	Suicide
Males ..	965	297
Females ..	227	272
Total ..	1,192	569

**POST-MORTEM APPEARANCES.** The face is usually ashy pale, but in some cases is slightly livid, with rosy patches about the cheeks. A characteristic sign is the presence of fine froth, sometimes tinged with blood, about the mouth and nostrils. *Rigor mortis* comes on early. The condition known as cadaveric spasm, a form of rigidity occurring at the moment of death, is sometimes observed, and articles grasped during the death struggle, such as reeds or plants, may be found firmly clenched in the hands. This is a valuable indication in distinguishing cases of drowning from cases in which the body was thrown into water after death. Internally the air-passages are found to contain a clear or blood-stained froth, and perhaps mud or portions of water-plants. The lungs are voluminous and distended, and when cut into exude a frothy, blood-stained fluid. Minute haemorrhages may be observed beneath the pleura, and the right side of the heart may be engorged with venous blood, the left being comparatively empty. The presence of water in the stomach, particularly if it contains pond-weed, etc., is virtually a conclusive sign of death from drowning, since water rarely enters the stomach of a body immersed after death.

**DIRECTIONS FOR RESCUERS.** Great care and presence of mind are required when endeavouring to rescue a person in danger of drowning who cannot swim, since the rescuer may be clutched and his movements impeded, so that he then runs the risk of being drowned himself. When the drowning person is struggling, the rescuer should leave him for a few seconds until he becomes quiet; then seize him by the hair, turn him on his back, and swim on the back towards the shore, or support him face upwards in this way until a boat arrives. Should the rescuer be clutched, the best plan is for him to take a full breath and allow himself to

be drawn under, when the drowning person may release his grip. If he does not let go, the rescuer must try to break away by forcing his knees against the chest of the drowning person.

**TREATMENT AFTER RESCUE.** When a person is recovered from water in an apparently lifeless condition, artificial respiration should be resorted to as soon as the sufferer is in the boat or has been brought to the shore. The most convenient method of performing artificial respiration is that recommended by Schäfer. The finger is introduced into the mouth in order to clear out any mud or froth, and the patient is then placed face downwards, the head being turned toward the side. The operator kneels either by the side of or astride the patient, and spreading his hands over the lower part of the back and sides of the chest, gradually throws his weight forward so as to exert a firm, steady pressure upon the thorax. He then swings backwards, so as to relax the pressure and allow the lungs to expand. This backward and forward movement should take about five seconds, and should be repeated at the rate of about twelve times a minute. It may be possible to stretch the victim on a plank which is forthwith balanced on a fulcrum such as a barrel or the seat of a boat and is swung see-saw fashion, in the rhythm of breathing, about twelve times per minute. This method helps to restore the blood circulation, upon which recovery from apparent drowning directly depends.



Dru. View of the Aiguille du Dru, near Chamonix

While artificial respiration is being performed further restorative measures should be applied. The wet clothing should be drawn off, the body wiped dry and wrapped in hot blankets, and hot bottles may be placed to the feet, care being taken that these are not so hot as to burn the skin. Friction of the limbs from below upwards is useful. Ammonia may be cautiously held to the nostrils, and a qualified person may give a hypodermic injection of strychnine or coramine. When breathing is established a hot bath is a useful means of restoring the bodily heat. *See Artificial Respiration.*

**Droxford.** Village of Hampshire, England, 8. m. N. of Fareham. Before the landings in Normandy in 1944 in the Second Great War, the headquarters of Gen. Eisenhower (S.H.A.E.F.) was a train on a stretch of the Southern rly. near Droxford station. Here he was visited by Winston Churchill, Gen. Smuts, Gen. de Gaulle, and British naval, military, and air force chiefs.

**Droydsden.** Parl. div. and urban dist. of Lancashire, England. The town stands on the Rochdale Canal, 5 m. by rly. E. of Manchester. There are cotton and print factories, and dye and chemical works. Pop. 24,070.

**Droysen, JOHANN GUSTAV (1808-84).** German historian. Born at Treptow, Pomerania, July 6, 1808, and educated at Stettin and Berlin, during 1840-51 Droysen was professor of history at Kiel, 1851-59 at Jena, and 1859-84 at Berlin. He died June 19, 1884. Droysen's chosen rôle as an historian was to glorify Prussia and her rulers, which he did especially in his monumental *History of Prussian Policy*, 14 vols., 1855-86; this takes the story down to 1756. Droysen wrote, as an historian, in favour of Prussia's claim to the duchies of Slesvig and Holstein, and as a politician he took part in the Frankfurt parliament of 1848. He wrote a valuable *History of Alexander the Great*, 1833; *History of Hellenism*, 1836-43; *Life of the Prussian soldier Yorck von Wartenburg*, 1851-52.

**Dru, AIGUILLE DU.** Rocky needle or peak in the Mont Blanc chain, near the Aiguille Verte,



J. G. Droysen, German historian



France. The Grand Dru or Pointe Este (alt. 12,320 ft.) was first ascended by Dent and Hartley in 1878; the Petit Dru or Pointe Charlet (alt. 12,244 ft.) by Charlet-Straton in 1879. See Alps.

**Drug.** A medicinal substance obtained from the vegetable, animal, and mineral kingdoms. The term also includes substances as prepared for use in the treatment of disease, but these are better distinguished as pharmaceutical preparations. Sometimes the word is employed to indicate habit-forming substances, such as opium and cocaine.

London is the world's chief port for drugs, hundreds of which arrive in the crude state from all parts of the world. They are stored in special warehouses at the docks, the purchasers generally being exporters. No drug auctions were held during the Second Great War, importation of crude drugs being severely limited by restrictions and lack of shipping space. In many instances home-produced drugs were used in place of imported products. Liverpool is the port for American drugs. Drugs imported wholesale must generally be sorted over—"garbled," as it is known in the trade—to separate the various grades. For example, pieces of rhubarb root of fine appearance are reserved for selling retail to the public, but broken pieces are equally well suited for reducing to powder, or for pharmaceutical preparations. Some drugs, such as aconite, belladonna, digitalis, henbane, lavender, peppermint, etc., are grown in Great Britain. Others require warmer or moister climates for their successful cultivation.

**DRUG HABIT.** Continuous taking of certain drugs produces in some persons an irresistible craving for them, despite their injurious effect upon both mind and body. The commonest instances are addiction to alcohol and tobacco. The less widespread drug habits—such as the taking of opium or cocaine—may originate in taking the drug in the first instance under medical orders, its use being continued because of pleasurable sensations produced. The victims display a progressive deterioration of their moral sense and when in the grip of the habit will lie freely and resort to any deceit to satisfy their craving. Another characteristic feature is the great degree of tolerance acquired after taking a drug for a considerable time, the victim of a drug habit often taking daily an amount of poison which would be fatal to a non-addict.

Opium taking is more frequent in women than in men. Morphia may be injected hypodermically, laudanum drunk, or solid opium eaten; opium smoking is more common in the East than in Europe. Morphia addicts become pale and sallow, and suffer from nausea, vomiting, loss of appetite, sleeplessness, and emaciation. Periods of severe mental depression follow the temporary exaltation at first produced by a dose. The temper becomes irritable, and the moral fibre degenerates. Delusions and hallucinations may occur. The remarkable tolerance that may be established is instanced by De Quincey (*q.v.*), who states that at one period he was taking 320 grains of opium a day, the full pharmacopoeial dose being two grains.

#### The Cocaine Habit

Cocaine is sometimes taken as a constituent of a snuff by persons suffering from nasal catarrh, and in this way the habit is initiated. Both the mental and bodily faculties become affected rapidly and severely. Cocaine takers develop extreme cunning in hiding the drug, to obtain which they will resort to any stratagem.

When the habit is definitely established no will-power can overcome it. The patient should enter a home or institution where he will be weaned from the drug. When the habit has not been of long duration, it may be possible to stop the drug at once, or reduce it very rapidly, but in long-standing cases the symptoms induced by abrupt withdrawal may be severe, and it is generally advisable to reduce the drug gradually.

The habitual taking of chloral hydrate is nearly always started by its use to induce sleep. The symptoms of chronic poisoning which gradually develop are dyspepsia, eruptions on the skin, weakness of the heart and respiration, and impairment of mental power. The acquisition of tolerance is not so marked as with opium, and a slightly greater dose than usual acting on the heart muscle may be fatal.

The taking of *Cannabis Indica* frequently becomes a habit in Egypt, India, and other Eastern countries, where it is absorbed in the form of hashish, bhang, or ganga. It produces symptoms resembling those of mild intoxication, followed by sleep which is often accompanied by pleasant dreams.

To check the serious growth of the drug habit legislation was

enacted in the Dangerous Drugs Acts, 1920 to 1932, to give effect to the Hague Convention of 1912, and the Geneva conventions of 1925 and 1931. The League of Nations drug control organization was transferred to U.N.O. The retail sale of drugs is controlled by the Food and Drugs Act, 1938.

**Drug.** District, subdivision, and town of Central Provinces, India, in the Chhatisgarh division. Area, 4,830 sq. m.; pop. 928,851, five-sixths Hindus. Of the total area about one-quarter is under cultivation, rice and wheat being among the chief crops. The town has small metal and weaving industries, and stands on the Bengal-Nagpur rly. Pop. 8,450, four-fifths Hindus.

**Drugget** (Fr. *droguet*, dim. of *drogue*, poor material). Coarse woollen stuff, woven or felted, sometimes printed with a pattern. It is chiefly used as a protection or substitute for carpets. The name is also applied to a stout fabric of linen warp and worsted weft for rough aprons, etc. In early times drugget was much used for clothing, being sometimes partly of silk.

**Druggist.** One of the titles reserved by the Pharmacy and Poisons Act, 1933, for registered pharmacists or corporate bodies of which the superintendent is a member of the governing body. Other titles reserved by this Act are "pharmaceutical chemist" and "pharmacist" or "member of the Pharmaceutical Society." Registration, not qualification, is the statutory condition for the use of these titles. A person not a registered pharmacist, *e.g.* an analytical chemist, may use the description "chemist" but not in connexion with the sale of goods by retail. The penalty for an offence in relation to titles is a fine not exceeding £20 and a further £5 for every day subsequent to conviction during which the contravention continues. A qualified druggist carrying on a retail business is authorised to sell poisons. Druggists deal generally in medicinal substances and chemicals required in the arts; in Great Britain they dispense prescriptions. See Dispensing.

**Drugstore.** Often regarded as the U.S.A. equivalent of a chemist's shop, this actually is much more. It dispenses more ices and soft drinks than medicines; it sells light refreshments, postage stamps, stationery, and certain fancy goods. It serves indeed as a sort of teetotal public-house, widely used as a social rendezvous.

**Druid.** Priest among the Celtic peoples, especially those of Britain and Gaul. The Druids were among the bitterest opponents of the Roman invaders, and in Britain were virtually exterminated during the Roman domination. The earliest detailed account of them is given by Caesar in his Gallic War, and his account is probably equally applicable to the Druids of Britain, which was the headquarters of Druidism. They are described as priests and law-givers, among whom all nobles and men of dignity were found.

The chief of them was elected, and no hereditary positions were recognized. They were learned in the natural sciences and astrology, while some of the classic writers describe them as sorcerers and masters of medical knowledge (Pliny); and as soothsayers and bards (Strabo). Their worship was carried on in groves, the oak being their sacred tree, and the oak-grown mistletoe played a particular part in their rites. It was cut with a golden weapon by a Druid clothed in white, was received from the tree on a spotless cloth by another Druid, and borne away by white oxen. Druidic worship entailed human sacrifices at special festivals; the victims being impaled, shot with arrows, or burned in wicker cages; the Druids exercising their peculiar art of divination from the movements of their dying victims, as well as from the flight of birds, etc.

The last stand of the Druids in Britain was made at Mona, or Anglesey, when the Romans are said to have exterminated them and destroyed their sacred groves (Tacitus). After being exterminated in Britain, Druids are mainly heard of in Ireland, where tradition associates them with witchcraft and sorcery.

*Bibliography.* Irish Druids and Old Irish Religions, J. Bonwick, 1894: Origin and Growth of Religion as Illustrated by Celtic Heathendom, J. Rhys, 3rd ed. 1898; Social History of Ancient Ireland, P. W. Joyce, 1903; Les Druids et les Dieux Celtiques, M. H. d'Arbois de Jubainville, 1906.



**Druid.** Arminius, prince of the Cherusci, triumphant after a victory over the Romans, brings back silver booty to his Druid priests

*After the painting by Hermann Prell*

**Druid Circle.** Name in popular usage for a prehistoric stone circle. One, vested in the National Trust, is near Keswick, Cumberland. Regarded by 18th century antiquarians as sites for Druidic worship, the exposed sepulchral dolmens often found with them were called Druid altars. Now recognized to be pre-Druidic, their subsequent adaptation for religious rites by the British priesthood of Caesar's day lacks definite proof. See Stonehenge: Stone Circles.

**Druids, ANCIENT ORDER OF.** Friendly society established on masonic principles and with masonic rites, and so called from an imagined imitation of the ancient Druids. The order was founded in London in 1781, and spread throughout England in independent but allied lodges. These lodges were later organized into groves and presided over by a Great Arch Druid. The order was introduced into the U.S.A. in 1883, where it spread rapidly.

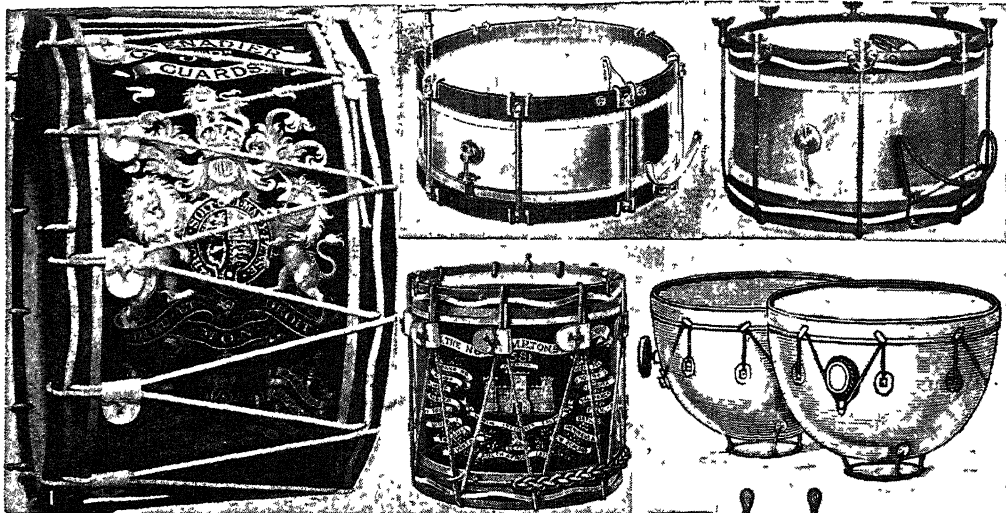
**Drum.** Instrument of percussion, consisting of a hollow body over which a membrane is stretched. In primitive form the body was a gourd, shell, or earthenware vessel, struck often by the finger tips.

Today the drums in use are of two main kinds: (1) Drums of cauldron shape, made of metal, with single head of vellum, used in the orchestra, and known as kettledrums (or Timpani). These are struck vertically by pairs of padded sticks, and produce notes of definite musical pitch. They were formerly used in pairs tuned to the tonic and dominant of the key of the music, but often three or more kettledrums are used in modern music, and they are given melodic as well as rhythmic passages. A pair of small kettledrums is used in cavalry bands.

(2) Drums of cylindrical shape, made usually of wood with two vellum heads. The pitch of these drums is indefinite. The smallest size, the shallow side drum with



**Druid Circle.** The circle near Keswick, Cumberland, about 100 ft. in diameter. It was vested in the National Trust in 1913



Drum. Examples of military and orchestral instruments. 1. Guards' bass drum. 2. Orchestral side-drum. 3. Military side-drum. 4. Guards' pattern side-drum. 5. Cavalry kettledrums. 6. Sticks for side-drum. 7. Sticks for bass drum

By courtesy of Hawkes & Son

metal sides, is played with hard wooden sticks, as is also the deeper military side-drum of wood. The largest is the bass drum, struck horizontally by heavy padded sticks. Of intermediate size is the tenor drum, used in bands of pipers. See Bagpipe; Cymbal.

**Drum.** In engineering, a cylinder, usually of cast iron or cast steel, mounted on a shaft and geared up to an engine, motor, or hand lever. A hoisting or hauling rope or chain is secured to the drum or may be given several turns round it. When the machinery is set in motion the drum, revolving, winds the rope around itself, paying out an equal length when the rope merely passes round it without being secured to it.

**Drumclog.** Hamlet of Lanarkshire, Scotland. It is 6 m. S.W. of Strathaven, near the border of Ayrshire, and was the scene of a victory of the Covenanters over the king's troops under Claverhouse (Viscount Dundee), on Sunday, June 1, 1679. A granite obelisk marks the site of the battle. Drumclog figures in Scott's *Old Mortality*. See Covenanters.

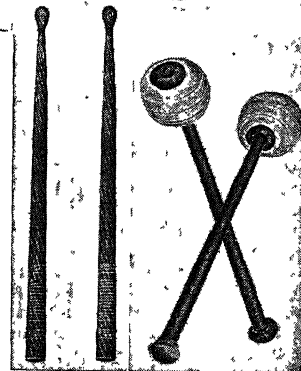
**Drum-Fire.** Expression for a rapid bombardment said by the German Staff account of the battles of Champagne to have been first used on the Champagne front in Feb., 1915. It is, however, much older, and occurs in Tolstoi's description of the Allies' bombardment of Sevastopol in Aug., 1855.

**Drum Language.** Method of communication by drum-signals, employed by primitive peoples. It has a possible range of 10 m. Across

Central Africa, from the Nile to Cameroons, it is in daily use for the exchange of news.

**Drumlanrig Castle.** Seat of the duke of Buccleuch in Dumfriesshire, Scotland. It stands on the Nith, 17 m. N.W. of Dumfries. It was built (1679-89) by the 1st duke of Queensberry, and suffered damage at the hands of Prince Charles Edward in 1745. In the grounds are the remains of Tibber's Castle, destroyed by Robert Bruce in 1311.

**Drumlin.** Elongated, oval-shaped hill found in regions which have suffered intense glaciation. It may be a mile or more in length, and up to 200 ft. in height. Where



many occur together a characteristic rolling landscape is produced with streams winding between the hills. Drumlins are composed of boulder clay and often have a core of solid rock. Their elongation



Drumclog. The battle on Drumclog Moor, Lanarkshire, in which the Covenanters defeated Graham of Claverhouse, June 1, 1679

Painting by Sir George Harvey, R.S.A.

indicates the direction in which the overriding ice-sheet was travelling. They are common in S. Scotland, Yorkshire, Ireland, N. Europe, and northern U.S.A.

**Drum Major.** Originally the principal drummer in a military band, the drum major now carries a staff for directing the band. In the regiments of Foot Guards drum majors wear a uniform that is a survival of the dress worn at the beginning of the 18th century.

**Drummond, HENRY** (1786-1860). British banker and politician, one of the founders of the Irvingite or Catholic Apostolic Church. He was born at Alresford, Hants, Dec. 5, 1786, and educated at Harrow and Christ Church, Oxford, became a partner in his father's bank, in 1810 was elected M.P. for Plympton Earls, and from 1847 till his death sat for W. Surrey. He founded the chair of political economy at Oxford, 1825. He died Feb. 20, 1860.

**Drummond, HENRY** (1851-1897). Scottish theological writer and scientist. Born at Glenelg, Stirling, Aug. 17, 1851, of an evangelical family, he was educated at Crieff, Edinburgh, and Tübingen. He was trained for the ministry at New College, Edinburgh, but did not adopt



Henry Drummond,  
Scottish theologian  
Lafayette

the title of minister. During 1873-75 he worked with Moody and Sankey, was appointed in 1877 lecturer on, and in 1884 professor of, natural science at the Free Church College, Glasgow, and held the last appointment until his death, at Tunbridge Wells, March 11, 1897. In the intervals of travel he devoted himself to mission work, and to the organization of the Boys' Brigade. His attempts to reconcile science and theology as expressed in his *Natural Law in the Spiritual World*, 1883, and the *Lowell Lectures on the Ascent of Man*, 1894, are now regarded as heterodox.

**Drummond, JAMES** (1835-1918). British theologian. He was born at Dublin and was educated at Trinity College. In 1860 he became colleague to the Rev. W. Gaskell, husband of the authoress of *Cranford*, at Cross Street Chapel, Manchester, and in 1869 he was appointed professor of Biblical and historical theology at Manchester New College, London. He became

principal in 1885 in succession to Dr. James Martineau, and held this position until 1906. In 1889 the college was removed to Oxford. He wrote *Life and Letters of James Martineau*, 1902, to which his colleague, C. B. Upton, contributed the section on Martineau's philosophy. Drummond died at Oxford, June 13, 1918.

**Drummond, THOMAS** (1797-1840). British engineer and administrator. Born in Edinburgh, Oct. 10, 1797, he was educated at its high school and at the R.M.A., Woolwich, and in 1815 entered the Royal Engineers. Having obtained a post on the trigonometrical survey of Great Britain in 1820, he invented the Drummond light, a limelight contrivance for long-distance surveying, and also an improved form of heliostat. Under-secretary for Ireland, 1835-40, he died at Dublin, April 15, 1840.

**Drummond, WILLIAM** (1585-1649). Scottish poet. He was born at Hawthornden, near Edinburgh, Dec. 13, 1585, a descendant of the mother of James I of Scotland. Educated in Edinburgh and France, he studied for the law, but on his father's death in 1610 settled down at Hawthornden to the companionship of his books, the pursuit of his hobby of mechanical invention, and his writings. His best work is in his sonnets, in which he followed closely Italian models; while the lyric beginning "Phoebus, arise," is celebrated. He invented the metre adopted by Milton for his *Hymn to the Nativity*. Drummond (who is always known as Drummond of Hawthornden) was one of the first Scottish poets to write in pure English.

Scholar and Platonist, he was a sincere royalist. The outstanding incident of his life is the visit Ben Jonson paid to him in the winter of 1618-19, his *Notes* on which, published in 1842, have been the cause of much controversy. He died Dec. 4, 1649. In 1893 a memorial to him was erected at Lasswade, where he was buried. The Hawthornden prize (*q.v.*) was founded in his honour. A *Life* by D. Masson appeared in 1873.

**Drummondville.** City of Quebec, Canada. It stands on the St. Francis river, in Drummond co., 65 m. N.E. of Montreal by C.N.R. and C.P.R. The main in-



William Drummond  
of Hawthornden  
After Jansen

dustries concern dairy machinery, hosiery silk mills, flax spinning and weaving, cotton mills, and artificial silk. Power is obtained from Lord's Falls and Hemming Falls on the river. Pop. 10,555.

**Drumochter Pass.** County boundary between Perthshire and Inverness-shire, Scotland. A bold, rocky scene, it is traversed by railway at 1,484 ft., the highest point reached by a rly. in Great Britain, and by the A9 main road from Perth to Inverness. A stone commemorates the building of the road by Gen. Wade's army.

**Drunkard's Cloak, THE.** Instrument used in some parts of England during the 16th century for the punishment of drunkards. It consisted of a tub with holes in the sides for the arms to pass through, and was fitted on to the offender, who then had to walk through the streets as an object of public scorn.

**Drunkenness.** State of intoxication. In certain cases it is an offence against the law, and in English law it is no excuse for crime. At the same time, when it is a question of *quo animo*, or with what intention a man did an act, he may escape because he may have been so drunk as to be incapable of forming any intention at all. Thus, a case of homicide may be manslaughter if committed by a man so drunk as not to know what he is doing, though the blow may be struck or the shot fired with apparent deliberation. If a man takes drink to nerve himself to commit a crime he cannot escape the consequences by showing that he was so drunk as to have lost all intention. It is an offence to be drunk in a public place or a licensed house, or to be drunk and disorderly. An habitual drunkard may be ordered to be confined in an inebriates' home by the magistrate.

A person driving or in charge of a motor vehicle in a public place while under the influence of drink to such an extent as to be incapable of properly controlling it must, except when there are special circumstances, be disqualified from driving for at least twelve months.

There is often a close psychological correlation between habitual drunkenness and homosexual tendencies, either overt or repressed. In these cases the habit is acquired in order to numb the pangs of conscience or the distress of being 'different,' and expert psycho-analysis may produce a cure. See *Liquor Control*; *Prohibition*; *Temperance*.

**Drury, ALFRED** (1857–1944). A British artist and sculptor. Born in London, he studied at the Oxford school of art, at S. Kensington, and under Dalou. He was first attracted to sculpture by the clay models of Chantrey's works in the Oxford university galleries. His first contribution to the Academy was the *Triumph of Silenus*, 1885; and in 1896 his bronze *S. Agnes* was bought for the Chantrey collection. He was elected A.R.A. in 1900, and R.A. in 1913. Other works include *The Age of Innocence*, 1897; *The Prophetess of Fate*, 1900; *King Edward VII*, 1903; a bust of Reynolds in the quadrangle at Burlington House, 1931; war memorials; statues and decorative work at Leeds. His technique is well shown in child portraits. Drury died Dec. 24, 1944.

**Drury Lane.** Thoroughfare and district in London, W.C.2, largely rebuilt in the 20th century. Extending from the modern crescent of Aldwych (*q.v.*) to High Holborn, the lane was originally known as the *Via de Aldwych*, after a Danish settlement in S. Clement's, which it linked with the hospital of S. Giles's monastery. Its present name derives from Drury Place, a mansion built in the 15th century by a member of the Drury family. In this mansion Essex and his followers planned the abortive rising of 1600. Rebuilt by William, earl of Craven, supposed husband of Elizabeth, the widowed queen of Bohemia, it was renamed *Craven House*; on its site in 1805 Philip Astley built the *Olympia Pavilion*, later the *Olympic Theatre*.

On the W. side of Drury Lane, in Russell Street, is Drury Lane Theatre (*v.i.*), with entrances in Russell Street and Catherine Street, and near by is the disused burial ground of S. Martin's, associated with *Tom-All-Alone's* of Dickens's novel, *Bleak House*. Near Holborn, on the E., is the Winter Garden Theatre, formerly *The Mogul*, and later the *Middlesex* music hall. A serving man of the ancient inn near here, *The White Hart*, gave first warning of the outbreak of the plague which started in the vicinity in 1665. In the adjacent coalyard was born Nell Gwynn, who later lived at a house in Drury Court, pulled down in 1891. Drury Lane was also the birthplace of Anne Clarges, afterwards duchess of Albemarle. On the E. side, S. of Great Queen Street, was Cockpit Alley, later Pit Place. A cockpit

was here, as were the Cockpit and Phoenix theatres.

Once lined with hedgerows and houses of the nobility, Drury Lane became in the 18th century a place of ill repute, its mazy courts and dark abodes the theme of satiric reference by Gay, Steele, Pope, and others. It was the scene of Hogarth's *Harlot's Progress*, *Lewknor's Lane*, renamed Macklin Street, being notorious. Notable residents were the poet Donne, who found hospitality in Drury House; William Alexander, earl of Stirling; Elliston, when lessee of the *Olympic*; Thomas Campbell, in *Vinegar Yard*; Charles and Mary Lamb, in *Russell Court*; and the actresses Anne Bracegirdle, whom Lord Mohun attempted to abduct from her house, and Hannah Pritchard.

**Drury Lane Theatre.** London playhouse, more correctly called *The Theatre Royal, Drury Lane*. The first theatre on the site of the present building was erected in 1661, and opened May 7, 1663, by the *King's Servants*—one of Charles II's two companies of players—under Thomas



Killigrew, with Beaumont and Fletcher's play, *The Humorous Lieutenant*. This theatre was burnt down in 1672. Sir Christopher Wren designed its successor, in which Garrick played. R. B. Sheridan had it replaced in 1794 by a much larger edifice, also destroyed by fire, Feb. 24, 1809.

Benjamin Wyatt was the architect of the 4th and present theatre, opened Oct. 12, 1812. On its boards Edmund Kean achieved his first great triumph as *Shylock* on Jan. 26, 1814, and there he appeared for the last time, March 12, 1833. Drury Lane won new prestige from Macready's brief management during 1842–43. It was here that he produced Brownings' *The Blot* on the *Scutcheon*. Under the management of Augustus Harris, and afterwards of Arthur Collins, the huge building was associated with immensely popular pantomimes and melodramas. In 1917 Sir Thomas Beecham began seasons of grand opera. The theatre was reconstructed in 1921–22 and reopened with *Decameron Nights*.

Many musical plays were given here, notably *Rose Marie*, 1926; *The Desert Song*, 1927; *Show Boat*, 1928; *Cavalcade*, 1931; and Ivor Novello's series, *Glamorous Night*, 1935; *Careless Rapture*, 1936; *Crest of the Wave*, 1937; *The Dancing Years*, 1939. Throughout the war the theatre was the headquarters of the *Entertainments National Service Association (Ensa)*. Part of the structure was damaged by German bombs, Oct. 15, 1940. Drury Lane reopened in 1946 with a production of Noel Coward's *Pacific 1860*, and *Oklahoma* was staged here in 1947. Consult *Theatre Royal, Drury Lane*, W. Macqueen Pope, 1945.

**Druses.** A Syrian people inhabiting the W. slope of Lebanon, anti-Lebanon and Hermon, and Hauran (Druz), mts. known as the *Jebel-Druse*. Occupying some 100 towns and villages and scattered elsewhere amongst other races, their total number is estimated to lie between 100,000–200,000. They are probably a mixture of different stocks, with



Drury Lane Theatre. Main entrance in Catherine Street. Top, Wren's, the second theatre on the site

a preponderating Arab element, the language spoken by them being Arabic. Others regard them as Iranians. They are under sheikhs or village headmen, themselves subordinate to ameers, both, together with the landed proprietors, forming a kind of supreme council. The vine, olive, and tobacco plant are cultivated, and silk-worms reared.

Religion of the Druses is a curious mixture of Mahomedanism, Judaism, and Christianity, but they pride themselves on being Muwahiddin, believers in one god. This one god is said to have manifested himself ten times in the flesh, the last time in the person of Hakim, the Fatimite caliph of Egypt (996-1021), who is expected to reappear as the Messiah. From his disciple and supporter Darazi, the name Druses is supposed to be derived. The people are divided into Akilis (learned), who alone possess knowledge of the sacred books and mysteries; and Jahilis (ignorant). They believe in the transmigration of souls, the soul passing from one body to another until perfect.

Forced to submit to Murad III in 1588, under their chief Fakr-ed-din in the early 17th century the Druses enjoyed their greatest prosperity. Beshir (c. 1786) kept himself in power by offering his services to various rebels, being finally obliged to quit the country when the Porte reconquered Syria in 1840. The adoption of Maronite Christianity by another Beshir led to civil war. Druses and Maronites were put under a separate kaimakan or governor, but after the Damascus massacre of Christians in 1860, the Lebanon district was placed under a Christian governor. Turkish misrule led to fresh disturbances in 1895-96, which, as the Turks made some concessions, were followed by a period of comparative quiet. A revolt in 1925 against the French, who had been given the Mandate over Syria after the First Great War, was put down with extreme severity.



Druses. Women of this Syrian people of the Lebanon wearing their characteristic costume

**Drusilla**, LIVIA (d. A.D. 29). Wife of the Roman emperor Augustus. She was previously the wife of Tiberius Claudius Nero, whom Augustus compelled to divorce her. Her elder son by the first marriage became the Roman emperor Tiberius, while her second son, with whom she was pregnant at the time of the divorce, was Drusus. She is not to be confused with Drusilla, wife of Felix, procurator of Judaea before whom S. Paul preached; nor with the daughter of Germanicus.

**Drusus**, MARCUS LIVIUS (d. 109 B.C.). Roman statesman, colleague of Gaius Gracchus in the tribuneship, 122 B.C. Won over by the senate, he vetoed the bills brought forward by Gracchus for founding colonies, and himself offered others making far greater concessions. His son, of the same name, tribune in 91, made proposals dealing with the distribution of public lands and rearrangement of the jury-courts. Having aroused suspicion by suggesting that the franchise should be extended to the Italians, he was assassinated.

**Drusus**, NERO CLAUDIUS (38-9 B.C.). A Roman soldier, son of Livia Drusilla by her first husband, Tiberius Claudius Nero. Her second husband, the em-

peror Augustus, conceived a great liking for Drusus, who became one of his most distinguished generals, and, between 13 and 9, conducted campaigns in Germany which extended the Roman dominion to the Elbe. He was the father of the emperor Claudius. This Drusus was called Senior, to distinguish him from his nephew, the son of Tiberius, who was poisoned at the instance of Sejanus (q.v.).

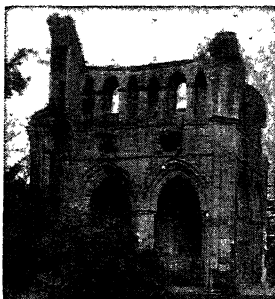
**Drusy Structure**. Term applied to a structure common to ore deposits formed at shallow depths, also to certain rocks. A druse is an unfilled portion of a vein or cavity in a rock. Druses often contain crystals with perfectly developed faces and vary in size from microscopic cavities to large caverns.

**Dryad** (Gr. *drys*, oak). In Greek mythology, nymph associated with trees. A dryad was supposed to live only as long as the particular tree with which she was associated. See Nymph.

**Dryas** (*Dryas octopetala*). Perennial dwarf shrub of the family Rosaceae. It is a native of Europe, Asia, and N. America. The short stem is embedded in the soil, and the numerous spreading and closely packed branches lie along the surface, bearing many tufts of oblong, toothed, evergreen leaves. The white flowers are 1½ ins. across, and the fruits are provided with long, feathery awns.

**Dryburgh Abbey**. Monastic ruin in Berwickshire, Scotland, on the Tweed, 4½ m. S.E. of Melrose. Generally stated to have been founded in 1150, it suffered at the hands of Edward II in 1322, was partially destroyed by Richard II in 1385, and almost totally demolished by the earl of Hertford in 1544. After the Reformation the property passed to the earl of Mar. The existing remains include the chapter house, parts of

the large and beautiful church, and traces of the monastic buildings. Sir Walter Scott and several of his relatives are buried in S. Mary's aisle. The 1st Earl Haig was buried in the adjoining burial place of the Haigs of Bemersyde, 1928. In 1918 the abbey was presented to the nation by Lord Glenconner.



Dryburgh Abbey. S. Mary's aisle, containing the tomb of Scott



**Dry Cell.** In electricity, a type of cell in which the solution is converted practically into a solid by the addition of chemicals of gelatinous materials which vary according to the type of cell. The advantages of dry cells are portability and cleanliness. A familiar use is in torches. *See* Cell, Electric.

**Dryden, JOHN** (1631-1700). English poet. Born at Aldwinkle, Northamptonshire, Aug. 9, 1631, he was educated at Westminster and Trinity College, Cambridge. Being possessed of a competence from his father's estate, he decided upon a literary career, and, to satisfy popular taste, he began to write plays, continuing to do so, chiefly for financial reasons, all the rest of his life. He wrote twenty-two in all, but he had no real gift for dramatic composition, and apart from certain isolated passages, Dryden's plays add nothing to his reputation. The best known are perhaps *The Indian Emperor*, 1665; *The Conquest of Granada*, 1670; and *Marriage à la Mode*, 1672. The plays are tainted with the licentiousness which characterises the Restoration drama.

Dryden's career in poetry proper began in 1659, when he published some verses on the death of Cromwell. A subsequent effort in 1660, *Astraea Redux*, a poem on the restoration of the monarchy, has laid Dryden open to the charge of trimming, but panegyric prompted by the passing of a great man is not necessarily inconsistent with an expression of welcome towards a new order of things after the gloomy years of Puritan rule. A much finer effort is the *Annus Mirabilis*, 1667, a poem on the wonderful year of 1666 which saw the end of the Great Plague of London, the Great Fire, and the Dutch War. A long period of writing for the stage ensued, and it was not until 1681 and 1682 that Dryden published his three great satires *Absalom* and *Achitophel*, *The Medal*, and *MacFlecknoe*. The first is an attack upon Lord Shaftesbury. He is Achitophel counselling the young duke of Monmouth, who is Absalom, to rebellion against his father. When Shaftesbury was tried for high treason and acquitted, his friends had a medal struck to celebrate the occasion. This provoked from Dryden the second satirical poem, considerably inferior to the first. The rival partisans engaged the minor poet Shadwell to reply in kind. Shadwell's effort was so vulgar and scurrilous that it provoked yet a third poem from Dryden entitled *MacFlecknoe*—from the name of

an obscure Irish bard—a masterpiece of subtle satire, which completely overwhelmed the unfortunate Shadwell.

Dryden's next poems, *Religio Laici*, 1682, and *The Hind and the Panther*, 1687, show him in quite a new light. The first appears to have been written in defence of the Church of England, while the second is in defence of the Church of Rome, to which he had in the meantime become a convert. The "milk-white hind immortal and unchanged" is the latter, while the spotted panther is the former. During the closing period of Dryden's life appeared his two noble odes, the *Ode for St. Cecilia's Day*, 1687, and *Alexander's Feast*, 1697; several verse translations of classical poets, and a number of miscellaneous writings, including a paraphrase of some of Chaucer's *Canterbury Tales*.



*John Dryden*

*After Kneller*

Up to the revolution of 1688 Dryden had enjoyed some degree of prosperity, having been made Poet Laureate in succession to Davenant, and receiving several other government appointments. Quite early in life he had married Lady Elizabeth Howard, daughter of the duke of Berkshire. The advent of William III deprived him of his laureateship and other offices. He died May 1, 1700, and was buried in Westminster Abbey.

There are echoes of the Elizabethans in the poetry of Dryden, but he belongs essentially to the classical school of poetry, which in the matter of form, at any rate, was brought to its highest point of

perfection by Pope in the next century. Less polished than Pope, Dryden has much more vigour in his poetry. The same quality of vigour is shown in the admirable prose of the prefaces to his plays. *See* English Literature.

**John McBain**

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**Dry Farming.** Special method of growing crops. In regions where the annual rainfall is under 20 ins., such as large tracts of Africa, Australia, and North America, they cannot be successfully grown on ordinary lines. To deal with such cases dry farming has been introduced. The essential feature is summer-tillage every other year, or once in three years, so as to store up moisture in the soil for the use of the crops that follow. Disk-harrowing, followed by deep ploughing and again by pressing with fluted rollers, removes all moisture-stealing weeds and produces a finely divided surface layer of "mulch," which checks evaporation and conserves the water in the soil. Most cereals do well, but barley, being shallow-rooted, is not to be recommended. The founder of the method was H. W. Campbell of Nebraska. *See* Agriculture.

**Drygalski.** Islet in Davis Sea, Antarctica. Off the coast of Queen Mary Land, it is about 9 m. in diameter. It was discovered by Sir D. Mawson, Jan. 21, 1914.

**Drygill Shales.** Group of sedimentary rocks on Caldbeck Fell, Cumberland. Like the Dufton shales on the W. Pennine slope in Westmorland, they represent isolated residual outcrops of strata deposited in late Ordovician time, when the Sleddale group of Conistone limestones was being laid down farther S. over the Lake district.

**Drying Machine.** Apparatus for removing moisture from textile materials. Excess moisture is removed from loose textile materials by centrifugal dryers, and also by squeezing rollers and afterwards passing the material through hot-air chambers upon conveyers. Cloth may be semi-dried by suction in passing over a cylinder, and further dried by transit over steam-heated cylinders. Drying cylinders for textile fabrics are arranged horizontally or vertically at will, and the speed of driving is adjusted to suit requirements. *See* Woollen.

**Dry Point.** Process of etching. It is closely akin to line engraving, in the preliminary stages of which it was often used, especially in outlining the general disposition of a subject. The tool is a steel rod tapering at one or both ends to a strong, fine, sharp point. With this the etcher draws with a firm hand, the point scratching a line of exquisite sensitiveness on the copper plate, and raising, as it goes along, a very distinct burr on the sides of the furrow, which lends particular quality to early prints from the plate.

**Dryptosaur** (Gr. *dryptein*, to tear; *sauros*, lizard). Extinct N. American reptile of the genus *Dryptosaurus*, alternatively called *Laelaps*. It was a carnivorous, beast-footed dinosaur, living in Montana in Upper Cretaceous times, and allied to the English megalosaur. It was 20 ft. long, rapacious, and sharp-toothed; it used the hind limbs and tail in kangaroo fashion. See *Dinosaur*.

**Dry Rot.** Diseased condition of timber due to the ravages of certain species of fungi, especially *Merulius lacrymans*. This fungus rapidly consumes the woody tissue, the affected parts ultimately becoming dark brown, dry, and powdery, with splits both along and across the grain. A certain degree of moisture is essential to the growth of the fungus; the timber must have a moisture content of over 20 p.c. When growing actively in still, damp air the fungus forms soft, white cushions, but under drier conditions becomes a thin, greyish skin.

A single plant of *Merulius lacrymans* puts forth millions of reproductive spores, which, being of microscopic size, may be borne about by the air, or conveyed imperceptibly from infected to sound timber by workmen's boots, clothing, timber, etc.; or the disease may be propagated by the dispersion of infected sawdust, or by the creeping of the fungus from one piece of timber to another, even when the pieces are separated by some material from which the fungus can derive no sustenance, but which it will use as a bridge, such as brick or stone. The common idea that the fungus eats away the interior of beams which outwardly appear sound is almost entirely erroneous. Thus, in the old roof of Westminster Hall some of the beams and rafters were hollowed to mere shells, but it was found that the damage was due to a boring beetle. Dry rot cannot

develop (though it may long remain latent) in wood to which air-currents have free access, and which has a moisture content of 20 p.c. or less.

Conformably to this assumption, architects and builders are legally required to provide effective ventilation and otherwise prevent dampness by inserting damp-proof courses, concreting foundations, and forming dry areas. Steeping the wood in creosote, corrosive sublimate, etc., has been recommended as an additional precaution against dry rot. The dry rot of oak-built ships is usually due to another species of fungus. See *Brickwork*; *Building*.

**Drysaltery.** Term applied to the business of a drysalter or the articles sold by him. These consist of heavy chemicals (borax, salt, soda, sulphur, etc.), dye-stuffs (alkaneet, indigo, etc.), gums (arabic, shellac, kauri, resin), oils (paraffin, linseed oil, boiled oil, turpentine), and crude drugs (linseed, senna, Epsom salt, Glauber's salt, etc.). Drysalters also sell pickles, preserved meat, and sauces.

**Dry Walling.** Uncemented wall used in stone-producing districts as a cheap form of boundary for fields. The stones are laid dry and the strength of the wall depends entirely on the ability of the builder to produce a good bond by correctly fitting the roughly cut stones. The wall is strengthened by bedding on the top course or adding an improvised coping.

**Dual.** Grammatical form originally used in some languages to express the idea of things naturally thought of in pairs, as the eyes and feet. It was then extended to other objects associated in twos (two men, two books). It is found in Sanskrit, ancient Greek, Arabic, and Hebrew, and traces of it occur in Anglo-Saxon.

**Duala.** This town in the Cameroons is described under its more usual French form Douala.

**Dual Control.** Method whereby either of two pilots may control an aircraft. The rudder and control levers are duplicated as are the engine throttle and switches. Dual control is essential on aircraft used for teaching pilots; in training aircraft there is a full set of controls in the pilot's seat and a duplicate in the passenger's seat, so that either the pupil or instructor can fly the aircraft. Large bombers and air liners are usually fitted with dual controls, so that the captain can hand over to the second pilot. Motor vehicles

with duplicated controls are used for instructing car drivers.

**Dual Ignition.** Arrangement by which two forms of ignition apparatus are fitted to an engine. One system is by accumulator and coil for starting purposes, and by magneto for the subsequent operation. The term is sometimes applied to the system of fitting two sparking plugs to the engine cylinder in order to produce two sparks simultaneously and thus facilitate the ignition of the explosive mixture.

**Dualism** (Lat. *dualis*, containing two). The assumption of two principles, as opposed to monism, the assumption of one. It may be applied to man (anthropological), to God (theological), to the world and existence (cosmological, metaphysical). Anthropological dualism regards man's body and soul as two distinct existences; theological dualism assumes two first principles, a good and a bad, eternally in conflict; cosmological dualism lays down two original substances or entities, mind and matter, thinking substance and extended substance, of which everything is composed.

In the ancient philosophies dualism appeared as the opposition of matter and form, later as a contest between objectivity and subjectivity, the last attempt to reconcile them being that of neo-Platonism. Descartes was the first of modern philosophers to substitute for this the dualism of mind and matter, and from his time the question how their relation to each other as manifested in experience is to be interpreted has engaged the attention of thinkers without any satisfactory or generally accepted explanation being reached. The reaction against idealism, which amounted to an abolition of dualism, has led to the reassertion of the latter by some philosophical writers.

**Dual Monarchy.** Name given to the empire of Austria-Hungary (*q.v.*), formed in 1867 by the union of Austria and Hungary. For half a century the two countries were joined under the same ruler, emperor of Austria and king of Hungary. As a result of the First Great War they became separate in 1918.

**Duars.** Another spelling of the name of a district in the Himalayas described under Dooars.

**Dubarry.** The mistress of Louis XV of France is described as Barry, M. J. B., Comtesse du.

**Dubawnt.** River and lake of the N.W. Territories, Canada. The river rises from Wholdiaia

Lake, almost on the border of Saskatchewan, and flows almost due N.N.E. to Dubawnt Lake. Issuing from this, it bends round to the N. again and then turns E. until it falls into Chesterfield Inlet, in Hudson Bay. Its length is about 580 m. The lake is really an extension of the river and is about 1,650 sq. m. in extent. Other lakes on the course are Aberdeen and Baker. The river's main tributary is the Thelon, which joins it as it turns E. The Dubawnt Basin forms part of the Barren Grounds, almost treeless and frequently frostbound, even during certain summers. The river was discovered in 1770.

**Dubbin.** Dressing applied to leather to soften it and render it waterproof. It is composed of Russian tallow softened with cod-liver oil and is especially used for waterproofing heavy boots.

**Dubbo.** Town of New South Wales, Australia. In Gordon co., it stands on the Macquarie river, 278 m. by rly. N.W. of Sydney, and is the trade centre of a vast pastoral and coal and copper mining area. Pop. 9,100.

**Dubica.** Town of Yugoslavia. It is situated on both banks of the Una, one portion being in Croatia and the other in Bosnia. The Croatian town is served by the main line rly. from Zagreb to Belgrade.

**Dubissa.** River of Lithuania, S.S.R. It joins the Niemen W. of Kovno (Kaunas). It came into prominence in 1915 during the fighting between the Russians and Germans when the latter attempted to overrun the Baltic provinces. After heavy fighting

along the river line, the Germans broke through the Russian positions on July 20.

**Dublin.** An eastern maritime county of Eire, in the province of Leinster, with about 72 m. of coast-line including indentations. Dublin Bay is the largest inlet, the Liffey, which debouches into it, the chief river, and Howth Head the most prominent cape. Lambay and several smaller islands near the coast are included in the county. Mountains occur in the S. (Kippure, 2,473 ft.), but the surface is generally a gently undulat-

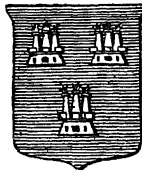
ing plain, almost entirely under cultivation, wheat, oats, barley, and potatoes being the chief crops raised; the N. and W. parts contain much pasture land. Mineral products include lead and copper ores, and granite; fishing is a thriving industry, and the leading manufactures are whisky, beer, and hosiery. The Eire state rlys. afford communication. After Dublin city, Dun Laoghaire, Swords, and Balbriggan are the most important towns. Its area is 385 sq. m. Pop., exclusive of Dublin city, 129,241.

## DUBLIN: THE CAPITAL CITY OF EIRE

H. L. Morrow

*All the principal towns of Eire are noticed under their own headings, as are the counties, rivers, etc. See also Dublin Society; Dublin University; Dublin Gate Theatre; Abbey Theatre; Phoenix Park, etc. For the events of 1916-20 see Ireland: History*

The city of Dublin, capital of Eire, has a population of just over half-a-million—almost one-



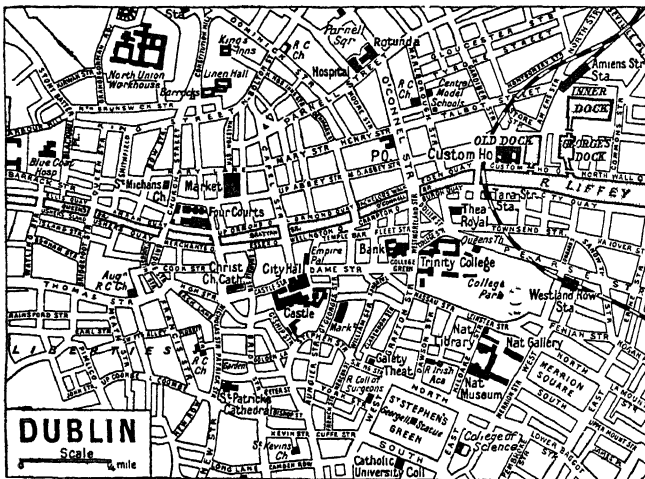
Dublin city arms

sixth of the population of the 26 counties of Ireland formerly comprising the Irish Free State. Situated on Dublin Bay, at the mouth of the Liffey, 61 m. W. of Holyhead, it is the centre of Eire's government, major industries, and two most famous universities, and of the social and intellectual life of the country. It is a city with an historic and dramatic past, happily enshrined for the most part in buildings which, escaping damage both in Ireland's domestic struggles and in the two Great Wars

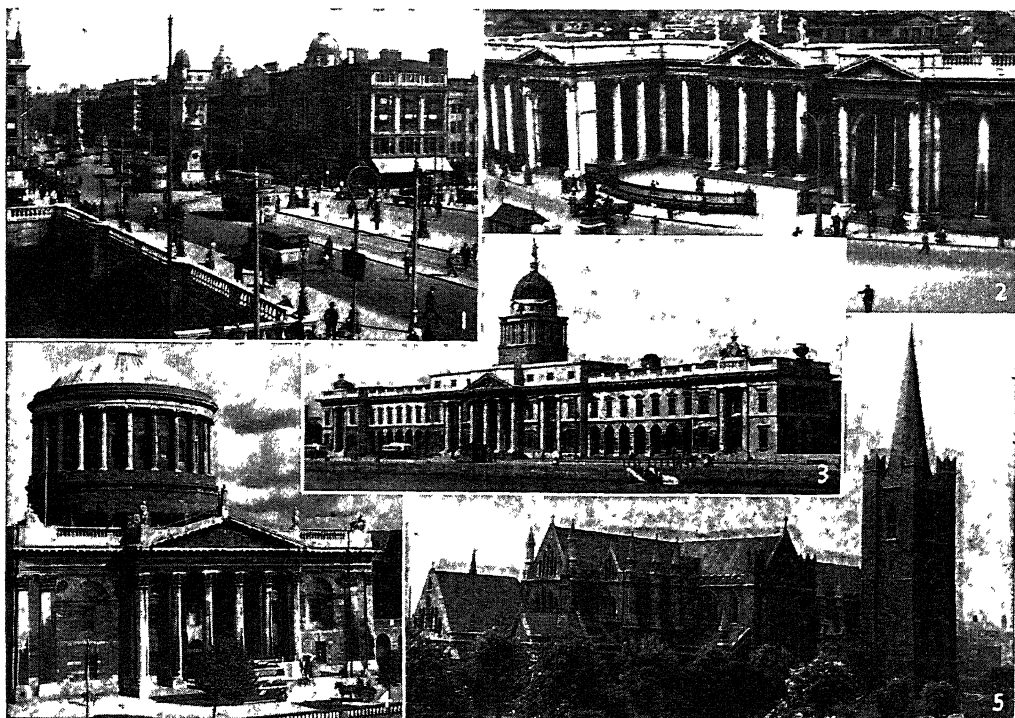
(despite a few German bombs dropped in the city on May 31, 1941), remain intact. If its acknowledged architectural beauties of Georgian squares and mansions are here and there marred by a degeneration into the slums depicted so vividly in the autobiography and plays of Seán O'Casey, the city is still, surprisingly, the Irish capital of Swift and Sheridan, Grattan and Tom Moore, no less than of James Joyce's Ulysses. Its most famous exports today—it has been justly remarked—are whisky, porter, and playwrights, among the last-named being Bernard Shaw, J. M. Synge, Seán O'Casey, and Denis Johnston.

The name is from the Irish *Dubh-linn*, meaning black pool, suggested by the pool made by the confluence of the Liffey with its tributary, the Poddle (now part of the city's sewerage system). On the establishment of the Irish Free State in 1922, the capital became known officially (which is by no means to say generally) as *Baile atha Cliath*, or Town of the Hurdle Ford, an Irish name of probably greater antiquity than *Dubh-linn*, and now used as the city's post-mark. To the Romans (who seem never to have crossed the Irish sea) the place was known as Eblana. Legend connects it dimly with S. Patrick, the national apostle, who is said to have caused a miraculous fountain to well up there to refresh his parched fellow-missionaries.

It was not, however, until the coming of the Danes at the beginning of the 9th century that Dublin emerged from semi-legend. Here in 840 the Danes under



Dublin. Plan of the capital of Eire, showing the situation of the Castle and other principal buildings



Dublin. 1. O'Connell Bridge, one of ten bridges over the Liffey. 2. Bank of Ireland, built for the 18th century House of Parliament. 3. Custom House. 4. The Four Courts. 5. S. Patrick's Cathedral, of which Swift was dean, 1713-45

Thorkils—no mere plunderer but a man of vision—built their first great fortress in Ireland. Though Thorkils was put to death by the resentful Irish the fortress he had established remained for just over eleven hundred years the chosen centre for successive invaders and “alien” administrations. It was at Clontarf, now one of the city's northern suburbs, that Brian Boru, the famous Irish chieftain, defeated the Danes in 1014 and finally destroyed Danish power in Ireland. Twenty-four years later the remnants of the Danish garrison, by then converted to Christianity by the Irish, laid the first stones of the church of the Blessed Trinity, now Christ Church Cathedral.

By the time Henry II landed in Ireland in 1171, Dublin had become recognized as the most important city of the country. Henceforth it was to be regarded by the English as the seat of English government in Ireland, which it remained in effect until the establishment of the Irish Free State in 1922. From Henry's time to the death of Elizabeth, after which, for over 300 years, no really effective resistance was put up by the Irish people as a

whole, it was the capital of the Pale—that part of the surrounding country, as Dr. D. A. Chart has put it, “still resisting absorption by the Irish.”

Modern Dublin is divided by the Liffey into two districts of almost equal sizes. In *Dáil Eireann* (*q.v.*) it is represented by two constituencies, Dublin North and Dublin South, the former returning eight and the latter seven deputies. Its pop. is 468,103. In the second half of the 18th century the Wide Street Commissioners undertook a town-planning scheme far ahead of its time. Among the thoroughfares laid out were those known today as O'Connell Street, Westmoreland Street, and Dame Street. Thanks to the genius of its late 18th century architects (most of them English or continental), in the older parts of the city are admirably designed, imposing, residential squares, such as Stephen's Green, Merrion Square, Fitzwilliam Square, Mountjoy Square, and Rutland (now Parnell) Square, all of which are probably unsurpassed in Great Britain, though their pleasing houses now mostly serve as flats and (in some cases) tenement dwellings swiftly falling into decay.

The city's 18th century architects—among whom were James Gandon, Francis and Richard Johnston, Robert Parke, Thomas Ivory, Sir William Chambers, and Richard Cassels, the German—made full use of the Liffey, which provided them with an admirably adaptable 3-m. waterfront stretching from the docks of the North Wall as far west as the Phoenix Park. Here, on the north bank of the river, are the Custom House, Gandon's Doric masterpiece, completed 1791, and his equally impressive Four Courts in the same style. Both these buildings suffered considerable interior damage in the “troubles” of 1916-22.

For the rest, the quays, stretching westwards as far as Kingsbridge station, terminus for both W. and S., are picturesquely lined with trees and narrow 18th century dwelling houses of four and five storeys, now turned into shops and offices, though still retaining dignity. The river is spanned by ten bridges, notable among them O'Connell Bridge, leading from Westmoreland Street to the wide sweeping thoroughfare of O'Connell Street (formerly Sackville Street), and the Metal

Bridge, an almost semi-circular single-span footbridge of cast-iron, over 100 years old.

The city's most imposing thoroughfare is O'Connell Street, named after Daniel O'Connell, "The Liberator." On the score of its proportions this can claim to be one of the finest streets in Europe. Badly damaged in both 1916 and 1922, its only building of note architecturally is the G.P.O., an imposing Ionic structure by R. Johnston, completed 1818, and the scene of the last stand by the rebel garrison during the Easter Week insurrection of 1916. Nelson's Pillar, focal point for tram and bus services, has escaped demolition at the hands of anti-British extremists (unlike the statues of William III and George III elsewhere in the city). At the N. end of the street is a striking statue of Parnell by Saint-Gaudens. The O'Connell statue by Foley and Brock, at the S. end, while imposing in dimensions, is in the tradition of civic sculpture.

Architecturally, Dublin's most pleasing cluster of buildings is at College Green, confluence of Dame Street, Westmoreland Street, and Grafton Street, with Keane's and Saunderson's long, gracefully-vermicated façade of Trinity College (usually wrongly attributed to Chambers) and the exquisitely curved façade of the Bank of Ireland, begun in 1729, the work of various hands, including Gandon and F. Johnston. This latter building housed Ireland's 18th-century parliament. Leinster House, in Kildare Street (designed by Cassels, who came to Dublin in 1720), once the magnificent home of the Dukes of Leinster, now accommodates Dáil Éireann and the Senate. Flanking it on Leinster Lawn are the National Gallery and the modern government buildings. St. Stephen's Green, laid out as a public park of some 22 acres, is lined with fine examples of late 18th- and early 19th-century architecture, including the headquarters of the Royal College of Surgeons of Ireland.

On the western outskirts of the city is the famous Phoenix Park, covering 1,760 acres and believed to be the largest city park in the world. Here are situated the zoological gardens (founded in 1830 and famed for its breeding of lions); the racecourse; the U.S. legation; the papal nunciature; and Arus an Uachtaráin, residence of the President of Éire, formerly the viceregal lodge. The

city is rich in churches of architectural interest. Most important are the two Protestant cathedrals—S. Patrick's and Christ Church. In the former, founded in 1190, lie Jonathan Swift and his "Stella," side by side. Christ Church was founded in 1038 and rebuilt by the Normans in 1172; it contains the tomb of Strongbow, who led the Norman invasion of Ireland. S. Michan's, near the Four Courts, dates from the 12th century and is remarkable for its vaults, where may be seen bodies which have lain for centuries without betraying signs of decomposition. S. Werburgh's, a Norman foundation, boasts a Grinling Gibbons pulpit, a massive memorial to the Geraldines, and the tomb of Lord Edward Fitzgerald, the 18th-century rebel leader. All these are now Protestant. The only R.C. church of antiquity is S. Audeon's, dating from the 13th century and containing the oldest church bells in Ireland. The R.C. pro-cathedral, consecrated in 1815, is modelled on the church of S. Philippe du Roule in Paris.

Dublin boasts two of the finest small art collections in Europe—the National Gallery of Ireland and the municipal collection of modern art. The former, opened 1864, contains an outstanding assembly of 17th-century Dutch canvases, including works by Rembrandt, Hals, Rubens, and Ruysdael; while the municipal gallery houses the famous collection of French impressionists and the modern English school presented to the city by Sir Hugh Lane in 1907.

For a city of its size, Dublin has an unusual wealth of museums and libraries. The National Museum and the National Library are both state institutions which have greatly added to their pre-1922 legacies, considerable as these were. Oldest and largest of the libraries is that of Trinity College, founded 1601, which numbers among its treasures the famous illuminated MS. known as the Book of Kells. Trinity Library still shares privilege of copyright with the British Museum and the Bodleian, by which it may demand a free copy of all books published in Britain. The Royal Irish Academy in Dawson Street has probably the finest collection of ancient Irish MSS. in the world, including the *Annals of the Four Masters*, and the *Leabhar Breac*.

Dublin's chief educational institutions are Trinity College (see

Dublin University) and the National University, the R.C. university in whose foundation J. H. Newman (*q.v.*) played an important part. There are also the Royal College of Physicians and the Royal College of Surgeons, while the Rotunda hospital's midwifery school has international recognition.

From the earliest years of the 18th century Dublin has been a centre for drama and music. Handel's *Messiah* was given its first performance here—in 1743, under the composer's direction. Henry Irving first appeared here. Since its foundation in 1903, the Abbey Theatre has continued to provide the world with both players and playwrights; since 1929 it has received a state subsidy of £1,000 a year. Besides supplying Dublin's finest spectacle—the August horse show—the Royal Dublin Society has for over half a century provided its members with some of the finest chamber music recitals in the world.

Dublin is Éire's transport centre. There are daily sailings between Dun Laoghaire and Liverpool and Holyhead; and air services to and from Liverpool, Manchester, and London. The Port and Docks Board, created in 1898, did much towards transforming Dublin into the considerable port it now is, making possible the rise of the ship-building industry. Consult *Glamour of Dublin*, D. L. Kay, 1918; *Dublin under the Georges*, 1714-1830, C. Maxwell, 1936; *Dublin Old and New*, S. L. Gwynn, 1936; As I was going down Sackville Street, O. St. J. Gogarty, 1937.

**Dublin Bay.** Inlet of the Irish Sea. It penetrates the E. coast of Éire as far as Dublin, a depth of about 10 m., and from its entrance at Howth peninsula on the N. to Dun Laoghaire on the S. is 6 m. Owing to its difficult navigation numerous lighthouses have been erected along its shores. The Liffey is the principal river discharging into the bay. The Hill of Howth at its N. end (562 ft.) and Killiney Hill at its S. (480 ft.) form conspicuous landmarks at the entrance. Its depth varies from 2½ to 10 fathoms.

**Dublin Gate Theatre.** Dublin playhouse and company. It was founded by Hilton Edwards and Michéal MacLiammoir in Oct., 1928, for the production of plays of unusual interest, and for experimenting in methods of production. Over 300 productions were launched, and dramatists whose work

became famous in Great Britain and America included Denis Johnston, Lord Longford, Seán O'Casey, Paul Vincent Carroll. In 1935 the company had its first London season at the Westminster Theatre, when *The Old Lady Says "No!"* and *Hamlet* drew enthusiastic audiences. The company visited Malta and Athens in 1938 and toured in the Balkans during 1939.

**Dublin Society, ROYAL.** Irish learned society. Founded in 1731 for the advancement of agriculture, industry, science, and art; incorporated by royal charter in 1750. Its activities include the holding of agricultural shows at Ball's Bridge—including the Dublin horse show; the granting of premiums for the encouragement of horse-breeding; lectures on scientific, agricultural, and general interests; recitals of chamber music; art scholarships and prizes; publication of transactions and proceedings. Formerly at Leinster House, its headquarters since 1929 has been at Ball's Bridge.

**Dublin University.** Irish university, consisting of Trinity College, Dublin. It was founded in 1591, under Protestant auspices, and still contains the Divinity school of the Church of Ireland, but has been undenominational since 1873. It is governed by a chancellor, board, senate, and council; the executive head is the provost. There are senior fellows, junior fellows, and scholars, and its courses resemble those of Oxford and Cambridge. The arrangements of the original Trinity College were modelled on those of Trinity, Cambridge. Undergraduates, as a general rule, must reside for a certain period in college, or in the vicinity. The normal degree course is four years; those therein being known as junior freshmen, senior freshmen, junior sophisters, and senior sophisters. The buildings, which are entered from College Green, are very extensive. Parliament Square contains the chapel, dining-hall, and examination hall, while in Library Square is the library with a priceless collection of manuscripts.

Among the modern buildings are the museum, and those of the medical school, in the college park. The college has also various museums and laboratories, as well as botanic gardens. Women have been eligible for degrees since 1904, and for them there is residential accommodation in Trinity Hall. Swift, Goldsmith,

Burke, and Berkeley, as well as the great Irish orators and statesmen, were students. In the 19th and 20th centuries may be mentioned Lecky, Dowden, Mahaffy, Bury, and Joly.

**Dubno.** Town of S.E. Europe, lying E. of the Curzon Line. It is 32 m. W. of Ostrog and 85 m. N.E. of Lwow. It was seized by Poland from Russia in 1920, and incorporated in the Volhynia co. of the restored republic; but was included in the Ukraine territory occupied by Soviet Russia after the German invasion of Poland, Sept., 1939. The principal industries of Dubno are tanning, brick-works, and tobacco manufacture. In the Middle Ages assemblies of Polish nobility were held here. In the First Great War Dubno fell to the Austrians in Sept., 1915, but was recaptured by the Russians on June 9, 1916, during Gen. Brusilov's offensive. The pop. before the Second Great War was about 14,000, mainly Jewish.

**Dubois, GUILLAUME** (1656–1723). A French statesman and cardinal. Born at Brive, Limousin, Sept. 6, 1656, he was educated by the monks in his native town, and entered their order. He completed his education at Paris, where he secured the post of tutor to the prince, who became the regent, Philip of Orléans. After 1715, when Philip became regent, Dubois was his chief counsellor.

The great work of the priest was to reverse the traditional policy of Louis XIV. He was strongly hostile to Spain, and brought about an alliance between France, Great Britain, and Holland. Dubois secured the archbishopric of Cambrai, and was made a cardinal in 1721. He remained chief minister when Louis XV came of age, but almost at once died at Versailles, Aug. 10, 1723. *Consult* Memoirs of Cardinal Dubois, P. Lacroix, Eng. trans. E. Dowson, 1899.

**Du Bois, WILLIAM EDWARD BURGHARDT** (b. 1868). American negro author and publicist. He was born at Great Barrington, Mass., and studied at Fisk university, Tenn. Further scholarships took him to Harvard, where his doctor's thesis, *The Suppression of the Slave Trade*, became the first volume in the *Harvard Historical Studies*, and later to Berlin university. He was professor of economics and history from 1896 to 1910 at Atlanta university, where he produced a monumental series of studies of the American negro. Du Bois came into conflict

with Booker Washington, whose educational policy for the negro differed from his; out of this controversy arose the National Association for the Advancement of Coloured Peoples, of which Du Bois became director of publications and research. Under his editorship its literary organ, *The Crisis*, introduced to the American public the first work of many distinguished negro writers. An autobiography, *Dusk of Dawn*, appeared in 1940.

**Dubovka.** Town of R.S.F.S.R. It stands on the right bank of the Volga, 32 m. N.N.E. of Stalingrad and in the region of that name. There are tanneries and mustard factories, and considerable trade is done in salt. Pop. 17,000.

**Dubricius** (d. 612). Welsh saint. Many unverified stories are related of him, as that he crowned king Arthur and exhorted the troops before the battle of Mount Badon. He probably founded the bishopric of Llandaff, and is regarded as one of the chief saints of Wales. His relics were translated from Bardsey Island, where he died, to a shrine in Llandaff cathedral in 1120. His festival is kept on Nov. 14.

**Dubrovnik.** City and seaport of Yugoslavia. Situated on the Dalmatian coast of the Adriatic Sea, it is 38 m. W.N.W. of Cattaro, and was formerly part of the Austro-Hungarian empire, when it was known as Ragusa. The city, which is surrounded by a wall with numerous towers, is divided into two nearly equal parts by the Corso, once an arm of the sea. Notable buildings include the palace of the former rulers, the customs house, formerly the mint, the cathedral, completed in 1713, and a Dominican monastery. It is the seat of a bishopric. As the harbour is impeded by sandbanks, large vessels use Gruz, 4 m. N. Oils, silk, leather, and liqueurs are the principal imports.

Subject at varying times to neighbouring states, Dubrovnik, together with much of the surrounding district, became in the 16th century a republic under the suzerainty of Turkey and rose to be a great commercial centre. In 1667 earthquake destroyed a large area and with plague killed a fifth of the population. The little state was extinguished in the Napoleonic wars and in 1814 Dubrovnik passed to Austria-Hungary. After the First Great War it became part of Yugoslavia. In the Second Great War the Italians occupied the port on April 17,



1941. They withdrew on the formation of the Croatian kingdom; but reoccupied the town in Sept. Bombed by the Allied air forces in 1943, it was liberated by Marshal Tito's troops on Oct. 20, 1944.

**Dubuque.** City of Iowa, U.S.A., the co. seat of Dubuque co. It stands on the Mississippi, 168 m. W.N.W. of Chicago, and is served by several rlys. An important river port and rly. centre, it communicates with the E. bank of the river by three bridges and with other ports by steamer. An R.C. archbishopric, it is the seat of the university of Dubuque, Wartburg theological seminary, and the state institute of arts and sciences. In a coal, zinc, iron, and lead mining district, it is the chief manufacturing centre in N. Iowa; it has meat packing plants, foundries and machine shops, rly. workshops, flour and lumber mills, and makes steel hulls, cars and wagons, agricultural implements, furniture, and leather. First settled in 1788 by Julien Dubuque, a French prospector, it was refounded in 1833, incorporated 1839, and chartered a year later. Pop. 43,892.

**Ducange, CHARLES DU FRESNE, SIEUR** (1610-88). French scholar. Born at Amiens, Dec. 18, 1610, and educated by the Jesuits, Ducange became a lawyer. He passed most of his life in study in Amiens and Paris, where he died Oct. 23, 1688. He edited the works of several French and Byzantine historians, Joinville among them, but his great work is his Latin glossary, 1678, which is really a compendious dictionary of medieval Latin. It has been frequently revised and enlarged, and the last edition was published at Nîort, 1883-87. He also compiled a Greek Glossary published in 1688.

**Ducat.** Coin, generally of gold, which circulated widely on the Continent in medieval times; value, 9s. 4d. It was first coined in silver, by Roger II, of Sicily, 1140. The gold ducat of Florence, coined in 1252, was followed by that of Venice, 1283. The name is derived from the word *ducatus* on Roger's money, referring to his duchy of Apulia. From Italy the coin and the name went to Hungary, Bohemia, Austria, and Germany. Its use ultimately spread to Russia, Spain, Denmark, and Holland; to Hanover, as late as George III's reign, and in 1887 to England, as a trial decimal gold coin, worth 100 pence. See Sequin.

**Duccio di Buoninsegna** (c. 1260-1319). Sienese painter. The only extant work indisputably by

this painter is the altar-piece for the high altar at Siena cathedral, now in the cathedral museum, representing the Virgin and Child surrounded by angels and saints. The back of this piece was composed of panels, some of which are now in the National Gallery, London. Duccio was the first Sienese painter to abandon the Byzantine tradition. He died Aug. 3, 1319.

**Duce, IL** (Italian, the leader). Title assumed by Benito Mussolini (*q.v.*) shortly after he formed his fascist government in Italy in 1922.

**Duchenne, GUILLAUME BENJAMIN AMAND** (1806-1875). French physician. He was born at Boulogne, Sept. 17, 1806, and educated at Douai. He then studied medicine in Paris until 1831 when he returned to his native town to practise. With the publication of *L'Electrisation Localisée*, 1855, and of *Physiologie des Mouvements*, 1867, he established his claim to be considered the founder of the science of electro-therapeutics. He specialised in the study of nervous disorders, particularly locomotor ataxia, and was a pioneer in the use of electricity as a cure for muscular diseases. He died Sept. 17, 1875.

**Duchess of Malfi, THE.** Tragedy in 5 acts by John Webster. Probably written in 1612 and produced about 1623, the plot was taken from Painter's Palace of Pleasure. Webster delighted in horror of a peculiar kind, and in this masterpiece he created passion, terror, and contrasting flashes of pathos. The duchess is represented as the victim of the sadistic Duke Ferdinand. In one of the most memorable scenes she is deceived by the counterfeit image of her murdered husband and children, and as the drama moves to its climax she is tormented by a dance of madmen, and finally strangled. The play contains passages of magnificent poetry, and has held the stage for more than three centuries. Modern revivals were at the Lyric Theatre, Hammersmith, 1919; Embassy Theatre, 1935; Haymarket Theatre, 1945.

**Duchess Theatre.** Playhouse in Catherine Street, Drury Lane, London, W.C.2. This theatre was opened Nov. 25, 1929, its first production being *Tunnel Trench*. Among later successes were J. B. Priestley's *Laburnum Grove*, 1933, and *Time and the Conways*, 1937; Emyln Williams's *Night Must Fall*, 1935; Norman Macowan's *Glorious Morning*, 1938. The Ballet Rambert held seasons here, 1938-39. The theatre can seat 494.

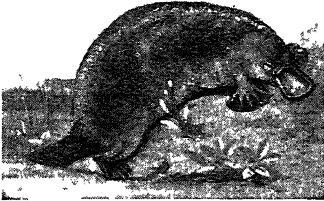
**Duck** OR **DUKW** This type of troop and store carrier of the Second Great War is described under *Amphibious Craft*.

**Duck** (Mid. E. *dukan*; Ger. *tauchen*, to dive). Name usually given to the largest group of birds of the order Anseres (of the family Anatidae), which includes swans, geese, and ducks. There are over 40 genera of ducks and nearly 200 species. They are distinguished by short legs, webbed feet, and a depressed and expanded beak. All the species are more or less aquatic, and most are powerful flyers. They are mainly herbivorous, with the exception of the merganser, which lives on fish, but frogs and worms are also readily eaten. The plumage is dense and compact, so that the water readily runs off it. As a rule, the male, or drake, has more showy plumage than the female, for which the term duck is commonly reserved. All the species lay uniformly coloured eggs.

Ducks are found all over the world, but are most numerous in the northern regions. They associate in flocks, and the majority migrate farther N. for the nesting season. On the wing the flock assumes a wedge-shaped formation. The numerous breeds of domesticated ducks are believed to have descended from the mallard, or wild duck, which breeds quite freely in captivity. All domesticated ducks interbreed with the wild duck; and their offspring is fertile, which goes to prove that the species is identical. The polygamous habits of the domesticated duck, the wild duck being monogamous, are probably merely the result of living under non-natural conditions. Domesticated ducks may be classed as ornamental, and those intended for the table. The ornamental are mainly species of British and foreign wild ducks maintained on lakes and in parks.

Fewer than a dozen European breeds can be regarded as of practical utility for the table or for supplying eggs. The Aylesbury is by far the most esteemed and most commonly bred variety in Great Britain. Its plumage is pure white, and it carries its boat-shaped body almost level with the ground. As it matures rapidly and attains a weight of 8-10 lb., it is much in demand for table purposes. The Rouen is simply a cultivated mallard. In plumage almost identical with the wild bird, it often weighs 11 lb., and its flesh is much superior to

that of any other native breed. But it is not altogether in favour outside France, for it matures so slowly that it often costs more in food than it fetches in the market. The Pekin duck, which came originally from China, may be re-



**Duck Bill.** Oviparous mammal of Australasia

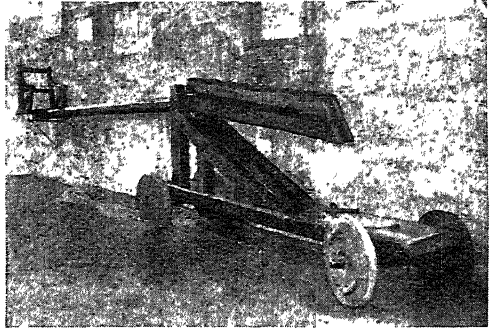
cognized by its yellowish-white plumage and its very upright carriage when walking, the legs being set very far back. A large specimen will weigh as much as 9 lb., but it is as an egg-layer that the breed is valued. The Indian runner is also a prolific layer of eggs, and these are often preferred for sale as those of the hen. It is not useful as a table bird since it seldom weighs more

than 4 lb. Swedish and Flemish ducks are also bred to a limited extent in Britain, and possess good table qualities.

The demand for ducklings far exceeds that for older birds, which are apt to be oily and strong in flavour, and the breeder should, therefore, aim at mating the birds early, Oct. being the best time. As ducks are not good sitters, the eggs are usually taken to be hatched under a hen or in the incubator. See Poultry Farming.

**Duck** (Dutch *doek*, linen cloth). Untwilled fabric, lighter and finer than canvas, used for clothing, sails, wagon covers, bags, etc. It is usually made of linen, sometimes of cotton. The word also denotes the creamy tint of linen yarn during bleaching

**Duck Bill, Duck-billed Platypus, or Duckmole.** Small web-



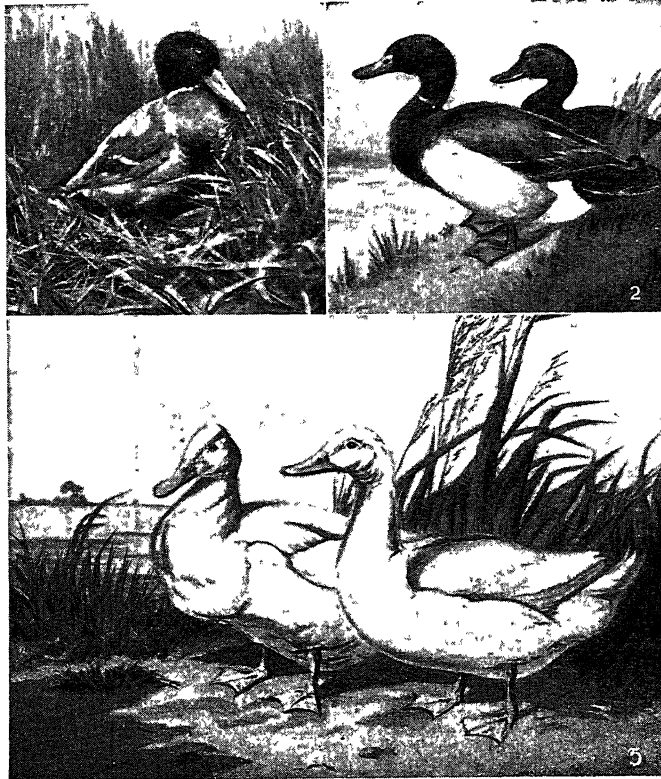
**Ducking Stool.** Example in the Priory Church, Leominster

footed and oviparous mammal (*Ornithorhynchus anatinus*), with a snout like the bill of a duck. It is about 18 ins. in length. No ears are visible above the fur, though the hearing is acute; the nostrils are placed near the tip of the bill. The hind feet of the male are armed with hollow spurs, communicating with poison glands, and probably used for fighting in the nuptial season. The adult duck bill has no teeth, but instead two pairs of horny plates on each jaw. It is peculiar to Australasia. See Ornithorhynchus.

**Ducking Stool.** Instrument formerly in use in Great Britain and in certain parts of the U.S.A. for the punishment of scolds. It consisted of a chair fastened to the end of a beam which, projecting over a pond or river, worked on a pivot from a post at the water's edge. The victim, usually a woman, was tied in the chair, and ducked by lowering the beam. The last record of its infliction was at Leominster, 1809.

**Duck-Shooting.** Sport mostly practised on the E. shores, inlets, estuaries, and broads of Great Britain. It may roughly be divided into (1) shooting with stanchion guns fixed in single or double handled punts; (2) from a punt with an ordinary gun while the birds are in flight; (3) and following on foot by open streams or drains.

The British wild ducks principally met with are the mallard, shoveller, gadwall, pochard, teal, and widgeon. These generally feed on fresh waters, and are therefore more valuable for eating purposes; scaup, eider, and the long-tailed ducks seldom leave the sea, and are useless as food. Wild ducks are very difficult to approach, and when using a punt it is necessary to lie flat along the bottom directly birds are sighted, and to remain in that position until after the shot.



**Duck.** 1. Mallard or wild duck, which breeds freely in captivity. 2. Rouen duck, much favoured in France. Its plumage is similar to that of the wild variety. 3. White Aylesbury ducks, the most esteemed and most commonly bred variety in Great Britain (from a drawing by Harrison Weir)

It is the practice in some countries to mask the bows of the boat with green leaves and branches; and in some instances decoy birds (*q.v.*) are used to induce the wild ducks to come near. *Consult* First Lessons in the Art of Wildfowling, A. Chapman, 1896.

**Duckweed** (*Lemna*).

Genus of minute, scale-like flowering plants of the family Lemnaceae. They are annual aquatic plants, floating on the surface of ponds and ditches, and consisting of a green disk, with or without a simple root or roots, forming sheets of green scum. They sometimes produce elementary flowers in the clefts of the margin, but rarely seeds, and are propagated by budding and by bulbils which hibernate in the mud.

**Duckworth, Sir Dyce** (1840–1928). British physician. Born Nov. 24, 1840, and educated at



**Sir Dyce Duckworth,**  
British physician  
*Elliott & Fry*

Liverpool. he afterwards studied medicine at Edinburgh university and S. Bartholomew's hospital. After being an assistant surgeon in the navy, he settled down to a consulting practice in London. He was made consulting physician to Edward VII, when prince of Wales, treasurer and then senior censor of the Royal College of Physicians, and consulting physician to S. Bartholomew's and the Seamen's hospitals. During 1904–10 he was medical referee to the Treasury. Knighted in 1886 and made a baronet in 1909, he died Jan. 20, 1928.

**Duckworth, Sir John Thomas** (1748–1817). British sailor. Born at Leatherhead, Feb. 28, 1748, he entered the navy when 11 years old and was present at Quiberon Bay. He was promoted commander in 1780, and in 1793 was appointed to the Orion, in which he greatly distinguished himself at Ushant, June 1, 1794. Knighted in 1801, in 1803 he was commander-in-chief of Jamaica, was promoted vice-admiral 1804, and defeated the French off San Domingo in 1806, for which he received a pension of £1,000 a year.



**Duckweed. A thick-leaved species,**  
*Lemna gibba*

In 1807 Duckworth was sent to Constantinople to dictate conditions to the Porte. With the assistance of the French, the Turks had strengthened the fortifications of the Dardanelles, but Duckworth forced the straits, Feb. 19, destroyed a squadron of frigates, and anchored 8 m. from Constantinople, where he was held up by wind and current and obliged to retreat. He was governor of Newfoundland, 1810–13, and was made a baronet in 1813. He died Aug. 31, 1817.

**Duckworth, Wynfrid Laurence Henry** (b. 1870). British anthropologist and anatomist. Born at Liverpool, June 5, 1870, he was educated at Birkenhead School, Dinan, and Jesus College, Cambridge. He studied medicine in London and anthropology in Paris. Lecturer in physical anthropology, 1898–1920, and reader in human anatomy, 1920–40, at Cambridge, he then became master of Jesus College until 1945. His publications included *Morphology and Anthropology*, 1904; *Prehistoric Man*, 1912.

**Duclaux, Madame.** This British authoress is also known under her maiden name of Agnes Mary Frances Robinson, and is so described in this work.

**Du Cros, Sir William Harvey** (1846–1918). British business man. Born June 19, 1846, he belonged to a Huguenot family that had migrated to Dublin from Montpellier in 1702. He was educated for the medical profession in Dublin, but soon turned his attention to the pneumatic tire industry, and later founded the motor manufacturing business of W. and G. Du Cros. Unionist M.P. for Hastings, 1906–08, he died Dec. 21, 1918. His son Sir Arthur Philip Du Cros (b. 1871), who became a baronet in 1916, was Unionist M.P. for Hastings 1908–18; Clapham 1918–22. He founded the Dunlop Rubber Company and instituted the motor ambulance movement in the First Great War.

**Ducrow, Andrew** (1793–1842). British equestrian performer and mimic. Born in Southwark, Oct. 10, 1793, the son of a celebrated strong man, he was early trained to equestrian and other circus feats. In 1808 he was chief equestrian and rope-dancer at Astley's; and in 1813 gained fame as a pantomimist in the part of Florio the dumb boy, in *The Forest of Bondy*. After touring the Continent, he returned to Astley's, which he eventually took over. On June 8, 1841, the building was

totally destroyed by fire. His mind gave way under the shock, and he died Jan. 27, 1842. It was Ducrow who, while watching Hamlet, urged the players to "cut the cackle and come to the 'osses."

**Ductility.** The property of metals through which they undergo plastic deformation—drawing out through a die, rolling into sheet, etc. The ductility of a metal is tested by stretching it under load until it breaks. This tensile test is usually carried out on a test piece 2 ins. long, ductility being expressed as the elongation per cent on 2 ins. All metals are ductile to some degree, although the property can be changed by varying the heat treatment. In general a cast metal will be less ductile than metal which has been annealed; a metal hardened by quenching will lose ductility. Gold and silver are the most ductile pure metals, while many alloys of copper, such as the bronzes and brasses, are more ductile than the pure metal. From the engineer's point of view, low ductility on a tensile test of a metal which is normally very ductile is an indication of a metallurgical defect.

**Duda, El.** Track junction 13 m. S.E. of Tobruk, Libya. El Duda was the most advanced point reached by the besieged Tobruk garrison in Dec., 1941. Three German counter-attacks failed to dislodge the British and Imperial forces from this position. On June 16, 1942, the Germans occupied El Duda, whereupon part of the British 8th army again withdrew behind the defences of Tobruk.

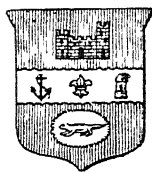
**Dudeney, Mrs. Henry** (1866–1945). British novelist. Daughter of Frederick Whiffin, she was born



**Mrs. Henry Dudeney,**  
British novelist  
*Russell*

Oct. 21, 1866, and educated at Hurstpierpoint. In 1884 she married Henry Ernest Dudeney (1857–1930), author of *The Canterbury Puzzles*, *Amusements in Mathematics*, etc. She died Nov. 21, 1945. Her novels include *The Maternity of Harriott Wicken*, 1902; *The Orchard Thief*; *Rachel Lorian*; *Set to Partners*; *The Secret Son*; *Seed Pods*; *Quince Alley* (her own favourite); *Brighton Beach*; *Put up the Shutters*.

**Dudley, Co.,** parl., and mun. bor. of Worcestershire, England. In a detached portion of the co., it is



Dudley arms

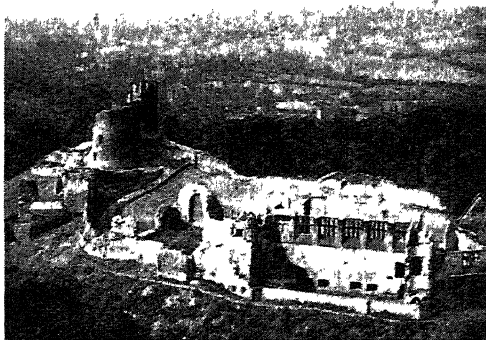
Black Country; there are coal and iron mines all around, with which the chief industries are connected—ironworks, brass foundries, engineering works, etc. Cycles and beer are also made and stone is quarried.

The buildings of the town include the parish church, a town hall, school of art and grammar school. There is a hospital, founded by Joseph Guest, a technical college, and a geological museum. There are the ruins of the castle around which the town grew, part of the grounds being now a zoo. Himley Hall, between Dudley and Wolverhampton, ancestral home of Lord Dudley, was sold to the West Midlands Coal Board in 1947. Adjacent to Dudley, but in Staffordshire, are Brierley Hill and Kingswinford, while Netherton is another industrial suburb. Dudley existed before the Norman conquest, and was a borough in medieval times, being represented in parliament in 1295. Its present incorporation dates from 1865. It is governed by a mayor and council, and elects an M.P. Market day, Sat. Pop. est. 58,700.

**Dudley, EARL OF.** English title held by the family of Ward since 1860. In much earlier times there was a baron of Dudley, who lived in Dudley Castle. The first baron, who lived in the 14th century, was named Sutton, but his descendants took the name of Dudley from their residence. Among them were Elizabeth's favourite, Robert Dudley, earl of Leicester, and other noted men of Tudor times. The barony remained in the family until its ninth holder died without sons in 1643. It passed then to his granddaughter, the wife of a wealthy goldsmith, Humble Ward, created Baron Ward of Birmingham, 1644. Their son Edward succeeded to both titles; but in

1757 the barony of Dudley fell into abeyance.

Meanwhile, another branch of the Wards was becoming prominent, and John Ward, another descendant of Humble, who had inherited the barony of Ward, was made Viscount Dudley in 1763. His grandson, John William Ward, 4th viscount (1771–1833), was foreign secretary in 1827–28. In 1827 he was made earl of Dudley, but the title became extinct on his death in 1833. Another descendant of Humble Ward, William Ward (1817–85), inherited much of his great wealth, and in 1860 was made earl of Dudley. His son, William Humble, 2nd earl (1867–1932), was



Dudley, Worcestershire. Castle ruins, in which Norman work prevails; it was destroyed by fire in 1750

lord-lieutenant of Ireland, 1902–06, and governor-general of Australia, 1908–11. William Humble Eric Ward (b. 1894) succeeded as 3rd earl in 1932. He was a director of Westminster Bank, G.W.R., and Phoenix Assurance. The wealth of the Wards is due to the possession of rich coalfields round Dudley. The earl's eldest son is known as Viscount Ednam.

The title must not be confused with the barony of Dudley (created 1439–40) and that of De L'Isle and Dudley (1835).

**Dudley, DUKE (1599–1684).** English ironmaster. Natural son of the fifth Baron Dudley, he was educated at Balliol College, Oxford. In 1619 he was placed in charge of his father's ironworks at Pensnet, Worcestershire, where he experimented with coal as furnace fuel. In spite of successful demonstrations, in 1651 he was forced to abandon his attempts. During the Civil War he was colonel in the king's army, and general of ordnance to Prince Maurice. In 1665 he published his work *Metallum Martis* or Iron Made with Pit-Coale, etc., but was careful not to

describe his process. He died at Worcester, Oct. 25, 1684.

**Dudley, EDMUND (d. 1510).** English lawyer. He studied at Oxford and Gray's Inn, and early gained the favour of Henry VII. While very young he was made a privy councillor, and in 1504 became speaker of the house of commons. Working with another lawyer, Richard Empson, he enriched himself and the king by a system of extortion based mainly on antiquated penal statutes. The day after Henry VIII's accession, Dudley and his colleague were arrested. They were attainted Jan. 21, 1510, found guilty of constructive treason, and were executed on Tower Hill, Aug. 17.

**Dudley, SIR HENRY BATE (1745–1824).** A British journalist. Born at Fenny Compton, Warwickshire, Aug. 25, 1745, he was the son of a clergyman named Bate. Educated at Queen's College, Oxford, he entered the Church of England and became, in succession to his father, rector of North Farnbridge, Essex. However, he took his duties very lightly, and it is as a journalist and society figure that he is known. He was editor of the *Morning Post* from 1772 to 1780, and afterwards founded the *Morning Chronicle*. His writings were often violent, while his behaviour was eccentric; always ready for a duel, he was called the fighting parson, and he spent at least one term in prison. In 1784 he took the name of Dudley on succeeding to some money, and in 1813 he was made a baronet. At one time he lived in Ireland, where he had livings and was chancellor of the diocese of Ferns. He died at Cheltenham, Feb. 1, 1824. The friend of Garrick and of other notables of the time, Dudley wrote the words for several comic operas to music by Arne and Shield.

**Duel** (Lat. *duellum*, old form of *bellum*, battle, from *duo*, two). Single combat engaged in by arrangement after challenge, and carried through on a recognized method of procedure, to settle a private quarrel or vindicate personal honour.

Historically the duel derives directly from the old legal method of settling disputes by ordeal by battle. The legal sanction given to decisions so arrived at commended the method to the popular mind, and the issue of a duel came to be accepted as a definitive settlement of a dispute between individuals over matters with regard to which they deemed it either undesirable or useless to appeal to law



Duel. Sword and Dagger Fight, a masterly representation of a sixteenth century duel, from the painting by John Pettee, R.A.

France is the country of origin of the modern duel. It was forbidden in civil matters as early as 1305, but without effect, and in the next two centuries duelling was generally prevalent. Francis I sent a challenge to Charles V of Germany, and although it was not accepted, this royal example was enough to sanction a fashion peculiarly congenial to the national temperament. It grew under Charles IX and became almost a mania under his successors, the third and fourth Henrys and Louis XIII. despite more than one ordinance and edict threatening penalty of death to principals and seconds alike. Rostand's picture of Cyrano de Bergerac and his brother cadets is no caricature of the young gallants of that day who mistook swashbuckling for chivalry, and who doffed cloak and drew rapier on any pretext or none. These hot-heads found a quarrel everywhere, and soon were not content with one second apiece, while the second for his part ceased to be content with looking on to see fair play. In the reign of Louis XIV the dukes of Nemours and Beaufort fought a duel in which four friends joined in on each side. Three of the ten were killed, including Nemours, and all the other seven were wounded. The duel had almost grown into a battle. As in Italy, as pictured by Shakespeare in *Romeo and Juliet*, again, no exaggerated caricature, so in France duelling became an intolerable evil.

Despite the spectacular encounter mentioned, Louis XIV has the credit of doing much to suppress the practice, by establishing a supreme court of honour, and still more by insisting on the punishment of all who disregarded the edict against it. As a practice, chiefly indulged in by

the aristocracy, the Revolutionists ignored it in their legislation, and during the first Republic and the first Empire it almost died out. It was revived, however, with the Restoration, and remains a custom in France, resorted to for the most part by ebullient editors and politicians and not often a bloody business, although as late as 1900 M. Marlier, a municipal councillor, was killed by M. Ferrette, a deputy, in Paris. A bill to stop duelling was submitted to the French Chamber in 1920.

In England duelling dates back as a custom to the beginning of the 17th century, in the latter part of which, after the Restoration, it experienced a great revival. Beau Fielding went out with Sir Henry Colt, the member for Westminster, in Feb., 1696, and wounded the baronet, who succeeded in disarming his opponent. The 5th Lord Byron killed Mr. Chaworth in 1765, and the duke of York met Colonel Lennox in 1789. Mr. Christie killed Scott, editor of *The London Magazine*, Feb. 16, 1821, and on March 21, 1829, the duke of Wellington had a bloodless encounter with the earl of Winchelsea. On July 3, 1843, Colonel Fawcett died of wounds received two days before in a duel with his brother-in-law, Lieut. Munro. The case led to action by the Prince Consort with regard to the military etiquette of duelling, in obedience to which alone Munro had gone out. In the event it was ordained in the articles of war that any officer who participated in a duel, whether as principal or as accessory or who did not do his best to prevent a duel, should be cashiered and the regulation is still in force.

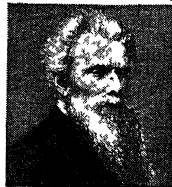
In the German army, up to the revolution of 1918 at least, officers

were required to submit disputes to a council of honour which arranged the matter if possible, and, if not, supervised the conditions of the encounter. The German students' duels are a more or less harmless form of university amusement. By English law duelling is an offence amounting to murder or manslaughter in the event of a death, and Major Campbell was hanged, in 1808, for having killed Captain Boyd in the previous June. In 1813, again, when Lieut. Blundell was killed in a duel, his opponent, Mr. Maguire, and both the seconds engaged, were convicted of murder and sentenced to death. In the event they were pardoned, but cashiered. On Oct. 19, 1852, when E. Barthélemy shot M. Cournet, an ex-officer of the French navy, at Crown Farm, between Windsor and Egham, both principals and seconds were refugees. Barthélemy, notwithstanding ferocious professions of Republicanism, was always suspected by other French refugees of being in the pay of the French police, and the cause of the duel was political.

**Duet** (Ital. *duetto*). Composition for two single voices or instruments, occasionally a double theme for a single instrument. In instrumental music the expression is used generally for a work for two similar instruments, e.g. two flutes. When written for different instruments, e.g. violin and flute, the more correct term is duo.

**Dufaupe, JULES ARMAND STANISLAS** (1798-1881). French advocate and politician. Born at Saujon, Charente-Inférieure, Dec. 4, 1798, he was minister of the interior in 1848 and 1849. After a long period of office he was minister of justice, 1871-73, and again 1875-76. From March 9 to Dec. 12, 1876, he was premier at a period of particular difficulty, when feeling ran high between the parties of Church and State. Both the president, Marshal MacMahon, and the senate were opposed to the premier's policy, and he resigned, only to return to office once more as premier late in 1877, until Feb. 1, 1879. He died in Paris, June 28, 1881.

**Duff, ALEXANDER** (1806-78). Scottish missionary. Born in Perthshire, April 26,



Alexander Duff, Scottish missionary

1806, he was educated at St. Andrews. In 1829 he went as a missionary to India. the first sent by the Church of Scotland, and

at once began the task of associating educational with evangelistic work. He set up schools and colleges, had much to do with founding Calcutta university, and for a time edited the Calcutta Review. At the disruption of 1843 Duff followed the leaders of the Free Church, and in 1851 he was its moderator, as he was again in 1873. Later he was professor of missions at New College, Edinburgh, and travelled all over the world. Duff, who is commemorated by Duff Hall, Calcutta, died Feb. 12, 1878. *Consult* Life, G. Smith, 1879.

**Duff, Sir Mountstuart Elphinstone Grant** (1829-1906). British author and politician. Born Feb. 21, 1829, at Eden, Aberdeenshire, he was educated at Edinburgh and Balliol College, Oxford, and was called to the bar at the Inner Temple, 1854. M.P. for the Elgin Burghs, 1857-81, he was under-secretary of state for India, 1868-74, and for the colonies, 1880. During 1881-86 he was governor of Madras. He will be best remembered for his series of Notes from a Diary. Other works include: Studies in European Politics, 1866; Notes of an Indian Journey, 1876; Sir Henry Maine, a brief memoir, 1892; Ernest Renan, 1893; and a biog. notice of Baron de Tabley in that writer's Flora of Cheshire, 1899. He died Jan. 12, 1906.

**Duff Cooper.** This British politician and diplomatist is noticed as Cooper, Sir Alfred Duff.

**Dufferin, Lady** (1807-67). Irish song writer. Eldest daughter of Tom Sheridan, and granddaughter



Lady Dufferin,  
Irish song writer  
By courtesy of John Murray

of R. B. Sheridan, she married in 1825 Commander Price Blackwood, who succeeded his father in 1839 as Baron Dufferin (d. 1841). She then devoted herself to educating her son, the future marquess of Dufferin and Ava (*v.i.*). In 1862 she married the earl of Gifford, then on his death-bed. She died at Highgate, June 13, 1867. Her best known poem is The Irish Emigrant, 1845. *Consult* Songs, Poems, Verses, with Memoir of the Sheridan Family, ed. by her son, 1894.

**Dufferin and Ava, Frederick Temple Hamilton-Temple Blackwood, 1st Marquess of** (1826-1902). British administrator. Born at Florence, June 21,

1826, son of the 4th Baron Dufferin and a descendant of R. B. Sheridan, he was educated at Eton and Christ Church, Oxford. He succeeded in 1841 to his father's Irish title, and in 1850 was made a British peer as Baron Clandeboye. He went as special commissioner to Syria in 1860 to inquire into the religious massacres, was appointed under-secretary for India in 1864, for war in 1866, and was created an earl in 1871. Governor-general of Canada, 1872-78, and viceroy of India, 1884-88, he became ambassador at Rome, 1888-92, and in Paris 1892-96. In 1888 he was created marquess of Dufferin and Ava.

After an exceptionally brilliant career, Lord Dufferin's later years were clouded by his unfortunate action in 1897 in accepting the chairmanship of the London and Globe Finance Corporation, of which Whitaker Wright (*q.v.*) was managing director, without adequate inquiry into its affairs, over which he had no control, but for the disastrous collapse of which he had to share the blame. This and the death of his eldest son, the earl of Ava, who was killed at Ladysmith in 1900, led to a breakdown in health, and he died at Clandeboye, Feb. 12, 1902. His Life was written by Sir A. C. Lyall, 1905.

Terence John Temple-Blackwood (1866-1918) succeeded his father as 2nd marquess. He was succeeded by his brother, Frederick Temple-Blackwood, who became speaker of the Northern Ireland Senate, and was killed in a flying accident at Meopham, Kent, July 21, 1930. The 4th marquess fell in action, March 25, 1945, his son Sheridan Frederick Terence (b. 1938) succeeding.

**Duffy, Sir Charles Gavan** (1816-1903). Irish nationalist and colonial statesman. He was born at Monaghan, April 12, 1816. In 1842, with John Dillon and Thomas Davis, he founded the Nation, the organ of the Young Ireland party. M.P. for New Ross, 1852-55, he afterwards emigrated to Australia. He became a member of the Victoria house of assembly, 1856, was twice minister of land and works, and in 1871 prime minister of Victoria. Knighted in 1873, he died at Nice, Feb. 9, 1903. He published the popular anthology, Ballad Poetry of Ireland, 1845.

**Duffy, George Gavan** (b. 1882). Irish politician and lawyer. He was born Oct. 21, 1882, and educated in France and at Stonyhurst. Practising as a solicitor in London, he was called to the Irish

bar in 1917, and the following year became Sinn Féin M.P. for S. Dublin. He prepared the defence of Casement, and was a signatory of the Irish treaty, 1921, and foreign minister in the provisional govt. of 1922. He became justice of the high court, 1936, and its president ten years later.

**Dufy, Raoul** (b. 1877). French painter. As a young man he was influenced by the *fauve* painters Matisse, Vlaminck, and Derain. His illustrations were prized by collectors of de luxe editions, e.g. woodcuts for Le Bestiaire, 1911; line blocks for Mallarmé's Madrigaux, 1920; etchings for Montfort's La Belle Enfant, 1930. His gay and witty designs influenced interior decoration and fabrics during the 1920s.

**Dugdale, Thomas Cantrell** (b. 1880). British painter. Born at Blackburn, June 2, 1880, he was educated at Manchester grammar school, and studied art at S. Kensington and in Paris. A member of the New English art club, he exhibited regularly at the Royal Academy, being elected A.R.A., in 1936 and R.A. in 1943. One of the foremost British portrait painters, he is represented in the Tate Gallery, London, and many provincial galleries.



T. C. Dugdale,  
British painter

**Dugdale, Sir William** (1605-86). English antiquary. Born at Shustoke, Warwickshire, Sept. 12,



1605, he came to London in 1635 to collect materials for his Antiquities of Warwickshire (1656). His royalist leanings led to his receiving several appointments, which he used for county "visitations." He was made Garter king-of-arms and knighted in 1677. He published a History of S. Paul's Cathedral, 1658; collaborated in a history of religious foundations, Monasticon Anglicanum, 1655-73; compiled a History of Embanking and Draining of Fens and Marshes, 1662; and The Baronage of England, 1675-76. He died Feb. 10, 1686. *Consult* Life, Diary, and Correspondence, ed. W. Hamper, 1827.

*Guilelmus Dugdale*  
From a portrait in the Bodleian Library



**Dugong** (*Halicornes*). Genus of herbivorous aquatic mammals of the order Sirenia, known as sea-cows. They are found in the Red Sea, and around the E. Indies and Australasia. From 8 to 12 ft. long, they resemble miniature whales, but are not true cetaceans.

**Dug-out.** Primitive form of boat or canoe. In forest regions riverain tribes, familiar with floating logs, probably soon developed a method of hollowing out a tree trunk by means of fire or an adze. See Boat illus.; Canoe illus.

**Duguay-Trouin, René** (1673-1736). French sailor. Born at St. Malo, June 10, 1673, in early youth he gave up clerical studies and took to the sea, where he distinguished himself in the war against England and Holland. He obtained a commission in the French navy in 1697 and fought with distinction in the War of the Spanish Succession, capturing Rio de Janeiro in 1711. He died at Paris, Sept. 27, 1736.

**Duhamel, Georges** (b. 1884). French author. Born in Paris, June 30, 1884, he became a doctor. Soon he was one of the founders of a society known as L'Abbaye, a group which lived on communal principles, each member supporting himself with a trade as well as practising his art. This experience was of short duration, and Duhamel later joined the Unanimités (*q.v.*). He wrote several volumes of verse, of which *Selon ma Loi*, 1910; *Compagnons*, 1912; and *Élégies*, 1920, are the most notable. His experiences as an army surgeon during the First Great War evoked the humanitarian prose volumes *Vie de Martyrs*, 1914-16, and *Civilisation*, 1917, which won the Goncourt prize in 1918. He was awarded the grand prix of the French Academy in 1930. This was the year of *Salavin*, a psychological study, translated 1936. He is best known for his famous family saga, translated as *The Pasquier Chronicles*, 1937, to which he added *Cécile* among the *Pasquiers* in 1940. Duhamel published some 50 volumes of novels, short stories, essays, travels poetry, and plays. During the Second Great War he made himself a national spokesman in *Why France Fights*, 1940.

**Duhamel, Jean Pierre François Guillot** (1730-1816). French metallurgist. Born near Coutances,

he was officially appointed to visit the mines of Foréz and two years later the Harz. By his discoveries and inventions he greatly improved steel manufacture in France. During 1781-1811 he held the professorship of mining and metallurgy at the French school of mining. In 1795 he was appointed inspector-general of mines.

He died Feb. 19, 1816.

**Duiker Bok.** Small S. african antelope of the genus *Cephalophus*. There are nearly 40 species, varying in size from the dimensions of a hare to those of a small donkey. They have short straight horns, usually with a crest of hair between them, and are of light and graceful form.

**Duisburg-Hamborn.** City of Germany, in N. Rhine-Westphalia. It stands between the Rhine and the Ruhr, 15 m. N. of Düsseldorf, and owes its great growth in the 19th century to collieries. Before its virtual destruction in the Second Great War it was the greatest inland port in Europe, centre of transit of the Ruhr industry. It had iron foundries, engineering and shipbuilding works, and made cotton goods and soap. Pop. pre-war, 431,256.

Duisburg was once a Roman station. For centuries it was part of the duchy of Cleves, which was joined to Brandenburg in 1614. During the troubles of 1919-20 there were risings in the town. Raids by the R.A.F. began in 1940 and were numerous. Troops of the U.S. 9th army captured the city after days of severe fighting on March 30, 1945.

**Dujana.** Former state of India, now merged in E. Punjab. Its founder was Abdul Samand Khan, a Pathan soldier of fortune, employed under Lord Lake. Opium and grain are the chief products. Chief town, Dujana, 37 m. W. of Delhi. Area, 100 sq. m. Pop. 30,666, four-fifths Hindus.

**Du Jardin, Karel** (1622-78). Dutch landscape painter. Born probably at Amsterdam, he studied under Nicolaas Berchem and at Rome. On his return to Holland he met with great success, but he preferred to make Italy his home, and died in Venice. Nov. 20, 1678. His landscapes are Italian rather than Dutch in feeling. The National Gallery, London, possesses a representative example of this painter's work.

**Dukas, Paul** (1865-1935). A French composer. Born of Jewish parentage Oct. 1, 1865, he studied at the Paris Conservatoire. His most important orchestral work, the *Symphony in C*, appeared in 1896, and the following year he established his reputation throughout Europe and the U.S.A. with *L'Apprenti Sorcier*, a descriptive work by which he is best known. His setting of *Ariane et Barbe-Bleue* (Maeterlinck) was first performed at Paris in 1907. Dukas died May 18, 1935.

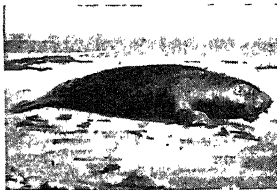
**Duke** (Lat. *dux*, leader). Title of nobility. The word was first applied to military commanders in the early Roman empire.

Later, as in the Frankish empire, a duke was a civil and military official. There were also territorial dukes, who ruled over large districts, *e.g.* Saxony. Gradually all the dukes became territorial. In Great Britain duke is the highest title of nobility. The first English duke was Edward the Black Prince, created duke of Cornwall in 1337. The first Scottish duke was David, son of King Robert III, who was made duke of Rothesay in 1398. See Peerage.

**Duke-Elder, Sir** (William) Stewart (b. 1898). British ophthalmic surgeon. Educated at St. Andrews and London universities, he became demonstrator of anatomy at Edinburgh royal infirmary, 1922, and St. George's hospital, London, 1923. He was ophthalmic surgeon at various London hospitals, surgeon-oculist to King George VI, consulting ophthalmic surgeon to the army, and examiner in ophthalmology at the Royal College of Surgeons and Physicians. He was knighted in 1933. His publications include *Text-book of Ophthalmology* in 3 vols.; *The Practice of Refraction*, 1943.

**Duke of Cornwall's Light Infantry.** English regiment. Originally of two battalions, the old

32nd and the old 46th Foot, it was raised in 1702 and served as Marines in the defence of Gibraltar, 1704. It took part in the battles of Dettingen and Fontenoy, the conquest of Canada (1759-60), the capture of Copenhagen (1807), the



Dugong. Sea-cow of the Indian Ocean. It feeds on seaweed



British duke's coronet



Duke of Cornwall's L.I. badge

Peninsular War, the Waterloo campaign, the second Sikh War, and the Crimean War. A great episode in the regiment's record was its defence of Lucknow during the Indian Mutiny. Later it took part in the Egyptian campaign (1882), the Nile expedition (1884), and the Burma and Tirah expeditions. In the S. African War the regiment was commanded by Sir Horace Smith-Dorrien. The nicknames, Red Feathers and Murray's Bucks, are popularly associated with the regiment. The former dates from the American War, when the old 46th, after surprising the Americans at Brandywine, stained the feathers of their headgear red in order that they might be more easily identified by the enemy. The latter commemorates a colonel of the regiment.

Fifteen battalions of the Duke of Cornwall's Light Infantry were raised for service in the First Great War and earned the honours: Mons; Marne, 1914; Ypres, 1915, '17; Somme, 1916, '18; Arras, 1917; Passchendaele; Cambrai, 1917, '18; Sambre; Dorian, 1917, '18; Gaza. The regimental memorial for the war is a statue of Cornish tin at Bodmin.

In the Second Great War this was one of the first British units to make contact with the enemy in France in 1940. After Dunkirk, the regiment went to N. Africa, and suffered heavy casualties at the defence of Tobruk in June, 1942. A later battalion served with the 1st army in Tunisia and was amongst the troops who advanced from Medjez el Bab in the closing stage of the campaign. Another battalion with the 8th army in Italy saw hard fighting at Cassino. Units landed in Normandy June 23, 1944, and a month later were in action against the crack Adolf Hitler division. The regiment served throughout the campaigns on the Continent, and formed part of the column which unsuccessfully attempted to relieve the 1st airborne division at Arnhem. The regimental depot is at Bodmin.

**Duke of Wellington's Regiment.** Regiment of the British army raised in the West Riding of Yorkshire in 1702 as the 33rd Foot. It first saw active service at Almansa in 1707. It later fought at Dettingen, and for its services in the Mahratta War earned a special

set of colours, the badge of the elephant, and the battle honour Hindustan. It later fought in the American War of Independence, capitulating at Yorktown. In 1794 the duke of Wellington assumed command, hence the title later awarded by Queen Victoria. The regiment served under Moore at Corunna and was with Wellington in the Peninsular campaign and at Waterloo. It fought in the Crimea, the Abyssinia expedition, and the Boer War.

In 1881, the 33rd Foot was amalgamated with the 76th and given the official title of the Duke of Wellington's (West Riding) Regiment; in 1920 this was altered to the Duke of Wellington's Regiment (West Riding). The regiment raised 21 battalions in the First Great War, and gained the battle honours: Mons; Marne, 1914, '18; Ypres, 1914, '15, '17; Hill 60; Somme, 1916, '18; Arras, 1917, '18; Cambrai, 1917, '18; Piave; and Suvla. In the Second Great War the regiment served in the battle of France, and in Africa, Italy, and Burma. Units of the regiment landed in Normandy shortly after D-day, and fought throughout the 1944-45 campaign on the Continent. The regimental depot is at Halifax.

**Duke of York Islands.** Group of islands in the Bismarck Archipelago (*q.v.*). They were a German possession, known as New Lauenburg, until captured by Austrians in the First Great War, Sept., 1914. Later the territory was held under mandate by New Zealand. Area, 22 sq. m.

**Duke of York's School.** Formerly known as the Royal Military Asylum, this school founded at Chelsea by Frederick, duke of York, in 1801-03, was transferred to Dover in 1909. It is a resident secondary school for the sons of warrant officers, n.c.o.s, or men who are serving, or have served, in the army or of officers who originally enlisted on normal engagement in the regular army and afterwards were promoted to commissioned rank. Boys can be registered when eight years of age but are not admitted before nine or after 12. Before selection all boys

are required to attend an educational, general, and medical test. Preference is given to sons of soldiers who have been killed in action.

**Duke of York's Theatre.** London theatre, in St. Martin's Lane, W.C., designed by Walter Emden and known as the Trafalgar Square Theatre, opened 1892. Here was produced *The Master Builder* by Ibsen. Re-named and reopened in 1895, the theatre staged several plays by Barrie—*The Admirable Crichton*, *Peter Pan*, *What Every Woman Knows*. Later successes were *Romance* (1,049 performances), 1915; *Daddy Long-Legs*, 1916; *London Calling*, 1923; *Jew Süss*, 1929; *London Wall*, 1931; *Is Your Honey-moon Really Necessary?*, 1944.

**Dukeries.** District in the N.W. of Nottinghamshire, England. It covers about 100 sq. m. and stretches from just N. of Mansfield



Dukeries, Nottinghamshire. The Duke's Drive, showing some of the trees for which this district is famous

to Worksop. It is usually entered from Edwinstone, where a rly. line crosses the district. Ollerton is another centre. Including the remains of Sherwood Forest, it has some fine woodland scenery.

Coal mines have been opened in the southern part of the district. The name is due to the fact that in the 18th century four dukes resided here. At Welbeck Abbey was the duke of Portland; at Clumber the duke of Newcastle; at Thoresby, now the seat of Earl Manvers, the duke of Kingston; and at Worksop Manor the duke of Norfolk.

**Dukes, ASHLEY** (b. 1885). A British dramatist and manager. Born at Bridgwater, May 29, 1885, he was educated at Silcoates school and at Manchester and Munich universities. After being dramatic critic for leading journals, he wrote plays, including *The Man with a Load of Mischief*, 1924; *One More River*, 1927;



Duke of Wellington's Regiment badge

The Dumb Wife of Cheapside 1929; The Mask of Virtue, 1935; Mandragola (from Machiavelli), 1939; Parisienne (from Becque), 1943. In 1933 he opened the Mercury Theatre, London, where his wife, Marie Rambert (*q.v.*), instituted the ballet club. Dukes was appointed to supervise theatrical production in the British zone of Germany in 1945. His critical works include Modern Dramatists, 1911; The World to Play With, 1928. The Scene is Changed, 1942, is autobiographical.



Ashley Dukes,  
British dramatist  
and manager

**Duke Town.** Former name of Old Calabar, situated on the Calabar river, Nigeria. See Calabar.

**Dukinfield.** Mun. bor. of Cheshire, England. It stands on the Tame, and is mostly within the par. bor. of Stalybridge and Hyde. It is on two railway lines, 6 m. E. of Manchester. The principal buildings are the town hall, free library, technical school. There are churches, schools, a public park and recreation grounds. The borough unites with Stalybridge, Hyde, and Mossley in a joint system of tramways and lighting. The chief industries are cotton manufacture, calico-printing, iron-working, engineering, and coal-mining. A bridge across the Tame connects Cheshire with Lancashire. Market day, Mon. Pop. 19,311.

**Dukla Pass.** Pass over the Carpathian Mts. between Polish Galicia and Slovakia. The Germans in occupation were driven from it by Czechoslovak troops, Oct., 1944.

**Dukw.** This type of troop and store carrier of the Second Great War is described under Amphibious Craft.

**Dulac, EDMUND** (b. 1882). Franco-British artist. Born at Toulouse, Oct. 22, 1882, he came to England in 1905 and became a British subject seven years later. He gave his first exhibition of water-colour drawings illustrating the Arabian Nights at the Leicester Galleries in 1907, and subsequently achieved a wide popularity



Edmund Dulac,  
Franco-British artist

by his illustrations of fairy tales, of Shakespeare's The Tempest, Poe's The Bells, and other poems. He also produced portraits, published cartoons, and designed stage costumes and décor.

**Dulanty, JOHN WHELAN.** Irish diplomatist. Educated at Manchester university, he became secretary to the faculty of technology there in 1908. In 1910 he was educational adviser to Indian students in northern universities of England, and became honorary director of the United Irish League of Great Britain. After holding civil service appointments, *e.g.* as principal secretary, ministry of Munitions, in 1917, he was appointed Irish commissioner for trade in Britain in 1926, and in 1930 became high commissioner for Ireland in London.

**Dulce.** Gulf or inlet of the Pacific Ocean, between Costa Rica and Panama. At its entrance are the points of Matapalo on the N. and Burica on the S.

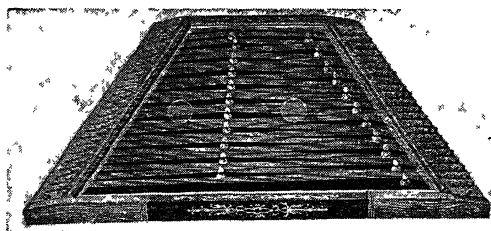
**Dulciana** (Lat. *dulcis*, sweet). Organ stop. The pipes in it are open and of small scale, possessing a delicate tone. Its invention is ascribed to Snetzler (18th cent.). The pipes are usually of 8 ft. pitch, but are sometimes 16 ft. or even 4 ft. See Organ.

**Dulcimer** (Lat. *dulcis*, sweet; Gr. *melos*, song). Musical instrument, from which the pianoforte has been evolved. It consists of a trapeze-shaped sounding-board, over which metal strings are stretched. These are struck by two hammers with flexible stems, and heads of which one side is hard and the other padded. The dulcimer, or cimbalom, is an important feature in Magyar bands.

**Dulcin, or SUCROL.** Substance with a pure, sweet taste, about 200 times as intense as that of cane sugar. It is used as a sweetening agent. Dulcitol or melampyrite, sometimes called dulcin, is the alcohol corresponding to galactose. It is obtained from Madagascar manna, *Melampyrum nemorosum*, and other plants. From Madagascar manna it is extracted by treatment with boiling water; from *Melampyrum nemorosum* by boiling the plant, dried when flowering, with water, adding milk of lime to the decoction until it is just alkaline, again boiling, and then decomposing the filtered liquid with hydrochloric acid. The dulcitol then separates out and is purified by recrystallisation. It is produced artificially by the action of sodium amalgam on lactose and galactose.

**Dulcinea del Toboso.** In Cervantes's Don Quixote, the imaginary lady to whom the Don consecrates himself—an idealisation of a farm girl, Aldonza Lorenzo. She is shown to him by Sancho Panza as a country wench riding an ass, and he is persuaded that she is the victim of enchantment.

**Dulong and Petit's Law.** Formulated in 1818. It stated that the specific heat of an element multiplied by its atomic weight is approximately equal to 6.2. This law proved useful in determining the atomic weights of metals, especially platinum, iridium, and others whose salts are non-volatile. It does not apply to some non-metals that are solid at ordinary temperatures. The specific heat varies with the temperature, decreasing with the fall in



Dulcimer, covering 3 octaves. There are 4 strings to each note, and the instrument contains 21 bridges  
By courtesy of Barnes & Mullins

temperature, and the law is no longer as useful as it was.

**Dulse** (*Rhodymenia palmata* and *Dilsea edulis*). Two fleshy, purple seaweeds of the family Rhodophyceae, growing on rocks in shallow water. The name belongs more especially to the first mentioned, which is used as food by the Scottish Highlanders and the Irish, who call it dilhsk, and when dried as a chewing tobacco substitute.



Dulse. Leaves of this edible seaweed

**Duluth.** A city of Minnesota, U.S.A., the co. seat of St. Louis co. At the W. end of Lake

Superior, 152 m. N.N.E. of St. Paul, it is served by several rlys., and shares with Superior, Wis., one of the best natural harbours in the world, whose annual tonnage is exceeded in the U.S.A. only by New York's. The harbour, formed by Minnesota Point, and a similar projection from Wisconsin, has an area of 19 sq. m. and a shore-line of 49 m. The mouth of the St. Louis, almost enclosed by other land projections, forms an inner harbour.

Duluth draws also on the richness of natural resources in its environs: iron ore, coal, lumber, and grain. One of the largest wholesale centres in the N.W., it makes iron and steel, machinery and metal goods, forest products, textiles, leather, chemicals, and glass. Its civic centre, the North Shore Drive, and its own site on steep slopes overlooking Lake Superior, make it one of the most beautiful cities in the U.S.A. Municipal government is by a mayor and council. Originally settled by French traders, the future town received impetus when J. J. Astor's American Fur Company established a trading post at Fond du Lac. It was incorporated as a city in 1870. Pop. 101,065.

**Dulverton.** Market town and parish of Somerset, England. It stands on the Barle and near the S. edge of Exmoor, 20 m. W. of Taunton. It has a railway station. Set in the midst of lovely scenery, it is a fishing and hunting centre. Near is Pixton Park. Dulverton is referred to in Blackmore's *Lorna Doone*. Pop. 1,502.

**Dulwich.** London residential suburb. Part of the borough of Camberwell, it lies S.E. of the city, between Denmark Hill, Herne Hill, and West Norwood on the W., and Peckham Rye, Nunhead, Forest Hill, and Upper Sydenham on the E. The oldest part, which retains much of its rural charm, is known

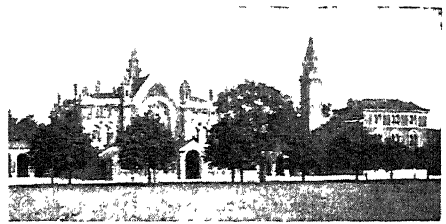
as the Village, and contains the buildings, much restored, of the college founded by Edward Alleyn, the chapel of which has served as the parish church and as a chapel of ease, the rest of the quadrangle containing almshouses. Dulwich Park, 72 acres, was presented to the public by the college trustees in 1890. Dulwich picture gallery, which was notable for its perfect quiet, as well as for its artistic treasures, was temporarily closed owing to severe damage by German bombs in 1944.

On a site occupied by the Grove Hotel stood the Green Man, a noted hostelry in the 18th century, in the grounds of which was a well producing the once famous spa-water; and here, later, was Dr. Glennie's Academy, which had Byron for a pupil. Anciently known as Dilwyshe, Dulwich was a manor belonging to the abbey of Bermondsey, presented after the dissolution to Thomas Calton, from whom it was purchased by Edward Alleyn. S. Stephen's church, College Road, designed by Sir Charles Barry, was built in 1869, in the Early English style; S. John's, a Gothic structure, in E. Dulwich, dates from 1865. Dulwich is served by electric railway (3 stations. N., E., and W.) and London Transport. It elects an M.P. Pop. 60,629.

**Dulwich College** OR THE COLLEGE OF GOD'S GIFT. English public school at Dulwich, founded and endowed by Edward Alleyn, the actor, in 1619. The property, which is land in S.E. London about 3½ m. in length by 1½ m. in breadth, increased enormously in value, and in 1857 a new scheme was approved by parliament. This provided for two schools, Dulwich College proper, and Alleyn's, which later became a public school in its own right.

Former pupils are called respectively Old Alleynians and Alleyn's Old Boys.

The college contains four sides, classical, modern, science, and engineering. It has ample buildings, laboratories, workshops, etc., and extensive playing fields. The new buildings of red brick in the Italian

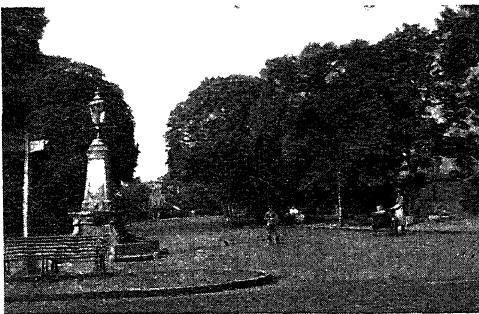


Dulwich College. Buildings in the Italian style designed by Sir Charles Barry and opened in 1870

style were from the designs of Sir Charles Barry. They are in College Road, and were opened in 1870. Dulwich College proper takes 820 boys, Alleyn's 640, most of them day boys from residential suburbs, but there are four boarding houses. There are a number of scholarships to the school, and from it to the universities.

**Dulwich Gallery.** Collection of pictures housed in a building near old Dulwich College. Noel Joseph Desenfans (d. 1807), a London dealer, left his pictures, originally collected for King Stanislaus of Poland, to his friend, Sir Peter Bourgeois, R.A. (1756-1811), who in turn bequeathed them to Dulwich College. Madame Desenfans commissioned Sir John Soane to design a building, which was opened in 1814. The collection of about 450 pictures is exceptionally rich in examples of the Dutch school; it is also noted for Watteau's *Bal Champêtre*, Reynolds's *Mrs. Siddons as the Tragic Muse* (whether original or replica is a moot point), and Gainsborough's *Mrs. Sheridan* and *Mrs. Tickell*. There are also characteristic works by Rembrandt, Adrian van Ostade, Cuyp, Doré, Murillo, Velazquez, and other masters. The gallery was severely damaged by German bombs in 1944. The pictures, however, had been removed for safety to Wales.

**Duma.** Representative state council of the former Russian Empire. It formed, with the half-elected and half-nominated council of the empire, or second chamber, the Russian legislature. The Duma, created Aug. 6, 1905, numbered 442 members. The electoral system was analogous to that of Soviet Russia, members being elected indirectly for five years, the elective assemblies of towns or districts sending delegates to a general electoral assembly, which chose the members of the Duma. These received a guinea a day for expenses during the session, and the cost of the journey to and from St. Petersburg (now Leningrad) once a year.



Dulwich. View of Dulwich Village, which retains a rural aspect, from the corner of Gallery Road

The Duma could not touch "the fundamental laws of the Imperial Administration," but within its sphere were the making of new laws, the modification of existing laws, the national budgets, the construction of state rlys., and any matters submitted to it by Imperial Decree. The chamber could be summoned or dissolved by the ukase of the emperor. No measure was submitted to the tsar for his sanction until it had been passed by both the Duma and the council of the Empire. The course of its brief history was stormy. The military revolution of Nov. 7, 1917, transferred the government of Russia to commissioners set up by Lenin, and the Duma ceased to exist. *Consult* History of Russia, V. O. Kluchevsky, 5 vols., 1931.

**Dumaguete.** Town of the Philippine Islands, capital of the prov. of Negros Oriental. It stands on Negros Island at the entrance to Tañon Strait, 90 m. (direct) S.S.E. of Bacolod. Its chief trade is connected with turtles and cotton. Pop. 16,500.

**Dumangas.** Town of the Philippine Islands, in the prov. of Iloilo. It stands on Dumangas river, near the S.E. coast of Panay Island, and has tobacco and linen industries. Pop. 12,400.

**Dumanjug.** Town of the Philippine Islands, on Cebu Island. It stands at the mouth of the Dumanjug river, 38 m. S.W. of Cebu town, and carries on a brisk trade in maize and other produce of the district. Pop. 22,000.

**Dumas, ALEXANDRE (1802-70).** French novelist and dramatist, whose full name was Alexandre Dumas-Davy de la Pailletterie. He was born at Villers-Cotterets, July 24, 1802, his father being the illegitimate son of a French noble, the Marquis Alexandre Davy de la Pailletterie, who had settled in San Domingo, and of a negress named Marie-Cessette Dumas. The father became a general in the French republican army.

About 1822 Dumas went to Paris. His first success was with a play, *Henri III et sa cour*, 1829; and competent French critics citing this piece, together with *Christine*, *Charles VII*, *La Tour de Nesle*, and *Mademoiselle de Belle-Isle*, claim for him an even higher place as a dramatist than as a teller of tales.

But to the majority of readers throughout the world Dumas is the author of that fantastic and unwearying romance, *The Count of Monte Cristo*, 1844-45, which translations have almost made a classic in numerous lan-

guages. To many English-speaking readers the most familiar of his other works are *The Three Musketeers*, *Twenty Years After*, *Memoirs of a Physician*, *The Queen's Necklace*, *Taking the Bastille*, *Chicot the Jester*, *The Black Tulip*, and other romances. Many are unfamiliar with what is beyond question Dumas' masterpiece, *Le Vicomte de Bragelonne* (26 vols., 1848-50), prodigious in extent, and scarcely rivalled in literature as a piece of pure, sparkling, and unflagging narrative.

He has set his name to a thousand or twelve hundred volumes: dramas, romances, books of travel, historical scraps, compilations on art, crime, and cookery. Clearly there was a good deal of hocus-pocus, of literary legerdemain, and worse, in the career of this amazing man. The air was charged with stories of Dumas' "ghosts," assistants, and collaborators—Maquet



*Alexandre Dumas*

and others. It may be said (1) that Dumas, who could keep half-a-dozen plots going at once, and was burdened with few scruples as to their origin and evolution, seems to have taken help from all quarters; (2) that, whatever tasks he may have assigned to his jackals, his own brain during many years was probably equal to the creation of what is best in the wonderful romances; and (3) that not one of these associates or auxiliaries, unassisted by the master, proved his rival in any field.

The day came when the power of the great man waned. This was the day of the shifts, schemes, devices to which none but a Dumas would or could have risen or descended. He put his name to any MS. that was brought to him, started impossible newspapers, lent himself to the wiles of advertising

Paris tradesmen. He died at Dieppe, Dec. 5, 1870.

**Bibliography.** Complete Works, ed. M. Levy, 277 vols., 1860-84; *Memoirs*, Eng. trans. E. M. Waller, 1907; *Lives*, P. H. Fitzgerald, 1873; H. Parigot, 1892; A. F. Davidson, 1902; H. A. Spurr, 1929; *Dumas: the Incredible Marquis*, H. S. Gorman, 1930.

**Dumas, ALEXANDRE, FILS (1824-95).** French novelist, dramatist, and academician. Born July 27,



1824, he was the natural son of the famous romancer, whose dramatic genius he inherited, but with whom otherwise he had little in common. When only twenty-four he made a sensation with a novel of passion, *La Dame aux Camélias*. After this he wrote other novels (e.g. *Diane de Lys*, 1851, *L'Affaire Clémenceau*, 1866); but the success of the dramatised versions of *La Dame* and *Diane* turned his energies to the stage, and it is as a playwright rather than as a novelist that he keeps his distinctive place.

Dumas was firmly convinced of the utility of the stage for the discussion of ethical questions and as an agent of social reform, and his plays, notably *La Question d'Argent*, *Le Fils Naturel*, *Le Père Prodigue*, *L'Ami des Femmes*, *Les Idées de Mme. Aubray*, *Une Visite de Noces*, are problem plays. While as plays they suffer at times from overstress of didactic purpose, Dumas' keen sense of the stage generally saved him from sinking into the mere preacher, while his incisive wit and brilliant style further contributed to his popular success. He died at Paris, Nov. 27, 1895. *Consult* A. Dumas, fils, J. Claretie, 1882; *Nouveaux Essais de Psychologie Contemporaine*, P. C. J. Bourget, 1885.

**Dumas, JEAN BAPTISTE ANDRÉ (1800-84).** French chemist. Hewas born at Alais, in the dept. of Gard, July 14, 1800, where he was apprenticed to a pharmacist. In 1823 he was appointed assistant to Thénard at the École Polytechnique, Paris, and shortly afterwards succeeded Robiquet as professor of chemistry at the Athenaeum.



J. B. A. Dumas,  
French chemist

Here he investigated experimentally the atomic theory enunciated a few years previously by Dalton. A study of compound ethers was followed by investigations concerning other organic compounds. He established that the organic acids form homologous series, *i.e.* series which differ from each other in chemical composition by multiples of carbon and hydrogen. He subsequently devoted more attention to physiological subjects, such as the phenomena of nutrition, the formation of sugar in the organism, and the composition of blood. A prolific writer, master of the French mint, and from 1875 an Academician, he died at Cannes, April 11, 1884.

**Du Maurier, DAPHNE.** British novelist and dramatist. The daughter of Sir Gerald Du Maurier, she was educated in Paris, and wrote her first novel, *The Loving Spirit*, in 1931. She wrote a successful biography of her father: *Gerald, A Portrait*, 1934; this was succeeded by a study of her family, *The Du Mauriers*, 1937. The novel *Rebecca*, 1936, proved an outstanding success as a play and film; *Jamaica Inn*, 1936, and *Frenchman's Creek*, 1941, were adapted for the screen. The scene of much of her work was laid in the West of England. Her play *The Years Between*, ran for over a year at Wyndham's Theatre, 1945.

**Du Maurier, GEORGE LOUIS PALMELLA BUSSON** (1834-96). British artist and author. Born in



Paris, March 6, 1834, he studied chemistry at University College, London, subsequently setting up as an analytical chemist. In 1856 he became an art student, first in Paris and then in Antwerp. In 1865 he joined the staff of Punch and began his famous series of social satires. In 1881 the Royal Society of Painters in Water Colours elected him a member. His sight failing rapidly towards the close of his life, he took to novel-writing, and produced Peter Ibbetson, 1892; Trilby, 1894 (serially in Harper's Magazine); and The Martian, published posthumously. Trilby, largely a reminiscence of Du Maurier's student days in Paris, enjoyed an extra-

ordinary success. Other volumes illustrated by him included Thackeray's *Esmond*, 1869; F. C. Philips's *As in a Looking-glass*, 1889. He died at Hampstead, Oct. 8, 1896. A review of his art and personality, by T. M. Wood, appeared in 1913.

His elder son, Guy Louis Busson Du Maurier (1865-1915), wrote a successful play *An Englishman's Home*, produced in London, 1909. He was killed in France, March 11, 1915.

**Du Maurier, SIR GERALD** (1873-1934). British actor. The younger son of George Du Maurier,



Sir Gerald Du Maurier, British actor

he was born in London, March 26, 1873, educated at Harrow, and made his stage debut in 1894 at the Garrick Theatre. He appeared in the original production of *The Admirable Crichton*, 1902, as the first Captain Hook in *Peter Pan*, 1904, and as Raffles in the play of that name, 1906. Leading a school of naturalistic acting to which some applied the term under-acting, he achieved an outstanding reputation by portrayals of well-groomed and imperturbable heroes in modern dramas; best remembered are *Bulldog Drummond*, 1921; *The Last of Mrs. Cheyney*, 1925; *Interference*, 1927; *Cynara*, 1930. He was also the original Dearth in *Barrie's Dear Brutus*. He made a reputation as actor-manager and producer, notably at Wyndham's Theatre; and appeared in a film of Galsworthy's play *Escape*, 1931. Knighted in 1922, he died suddenly April 11, 1934. *Consult* Gerald, *A Portrait*, D. Du Maurier, 1934.

**Dumbarton.** Royal, mun. and parl. burgh, also a seaport and the county town of Dumbartonshire. Scotland. It stands where the river Leven falls into the Clyde, 15½ m. W.N.W. of Glasgow. The town is well served by rlys. Buildings of note are the municipal group, in baronial style, 1899. the county buildings, 1844 and later enlarged; the Old Academy



Dumbarton. The Rock of Dumbarton, showing the castle where Wallace was imprisoned in 1305

and burgh hall, 1865; the Denny memorial; and public library. The R.C. church of S. Patrick (said to have been born near) has the only carillon in Scotland. The castle stands on a basalt rock 250 ft. high. The chief industry was once glass making, but is now shipbuilding; there are also iron foundries, boiler tube works, an aircraft factory, and a distillery. Dumbarton was both a Celtic and a Roman town; it was the capital of the 6th century kingdom of Strathclyde, and received a royal charter in 1222. There is a fair in Aug. Market day, Tues. One M.P. is returned for Dumbarton and Clydebank. Pop. 22,000.

**Dumbarton Oaks.** Eighteenth century mansion near Washington, U.S.A. Here on Aug. 21, 1944, in furtherance of the Moscow Declaration (*q.v.*) of 1943, representatives of Great Britain, the U.S.A., and the U.S.S.R. met for preliminary discussions as to the structure and aims of a new international league to enforce peace. The Anglo-American-Soviet talks resulted in a large measure of agreement and the drawing up of a draft framework. The Russian delegation withdrew on Sept. 29, and a Chinese delegation took its place. (Although China was at war with Germany and Italy as well as with Japan, the U.S.S.R. was not then at war with Japan.) The conference ended on Oct. 7, the Chinese delegate having approved the draft, which formed the basis for the deliberations of the San Francisco Conference (*q.v.*) at which the United Nations (*q.v.*) organization was born.

**Dumbartonshire** OR DUMBARTONSHIRE. Western county of Scotland. It is almost entirely surrounded by water—E. by Loch Lomond, W. by Loch Long, and S. by the Clyde estuary, a small detached part of it lying between Stirling and Lanark. The



Dumbarton arms



Dumbartonshire arms



surface is mountainous in the W. (highest point Ben Vorlich, 3,092 ft.), and generally hilly elsewhere, except in the S. where the soil is well cultivated. The mountain, glen, and loch scenery is magnificent. The chief rivers, after the Clyde, are the Leven and Kelvin.

in each hand, and a series of exercises is then carried out. It is claimed that their use brings every muscle of the body into play. Iron dumb-bells, which are most in use, weigh from 4 lb. to 6 lb. each, but heavier ones are occasionally employed. They are sometimes covered with leather. The first dumb-bells consisted of sticks loaded with lead at the ends, and were so called because these ends were shaped like bells. Dumb-bells are said to have been first used in the time of Elizabeth.

**Dumb Cane** (*Dieffenbachia seguine*). An evergreen perennial plant of the family Araceae, native of the West Indies. It has

Congenital dumbness may be due to mental deficiency or to absence from the brain of the speech centre. Dumbness in children, however, is due much more frequently to deafness, congenital or acquired in infancy. The child cannot speak because it has not the use of its ears to guide its speech. Even partial deafness occurring in childhood may cause dumbness. It is important to ascertain whether the deafness is marked or comparatively slight. Any middle ear disease or adenoids should be dealt with to improve the hearing up to its maximum. Tongue-tie may be a missed cause. *See Deafness.*

**Dum-Dum** OR DAMDAMA (Hind. raised mound). Town and municipality in the Barrackpore subdivision of the 24 Parganas, Bengal, India. It is 7 m. N.E. of Calcutta. Its government ammunition factory, much expanded during the two Great Wars, has given the name to soft-nosed bullets. Dum-Dum was the headquarters of the Bengal artillery of the East India co. from 1783 to 1853, when a move was made to Meerut. The mess-house of the artillery is now known as the Outram Institute, where the bust of Outram stands on the verandah. In Barrack Square is a monument to the officers and men killed in the retreat from Kabul, 1841-42. After the recapture of Calcutta in 1757 the treaty restoring the British settlements was signed in Dum-Dum, where Clive had a house. The headquarters of the Calcutta Flying Club, Dum-Dum had an airport which took the international traffic from Europe to the Far East and Australia. Pop. about 30,000.

**Dum-Dum Bullet.** Popular term for all projectiles of small calibre which expand or flatten

Roseneath Castle, on Roseneath peninsula, is a seat of the duke of Argyll. Cattle and sheep rearing, engineering and shipbuilding are thriving industries, cotton goods, glass, and sewing machines are manufactured, and along the Vale of Leven are many bleachfields and dye works. Coal, iron, and slate are the principal mineral products. British Railways (Scottish region) and the Forth and Clyde Canal serve the county.

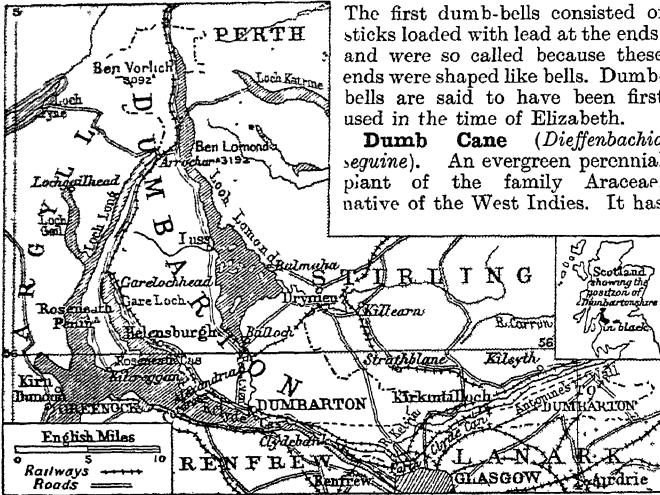
Dumbarton (the county town), Clydebank, and Kirkintilloch are the largest towns; Helensburgh and Kilcreggan are health resorts. A second M.P. was allotted in 1948. Formerly Dumbartonshire was part of the old Scottish territory of Lennox. Land area, 246 sq. m. Pop. est. 158,800.

**LITERARY ASSOCIATIONS.** Tobias Smollett was born near Renton, where a 60-ft. column was erected to his memory. David Gray, the poet, was born at Merkland, Kirkintilloch, and died there at the age of 23. He is buried in Kirkintilloch churchyard. Many associations linger about Loch Lomond, notably with Scott's Rob Roy.

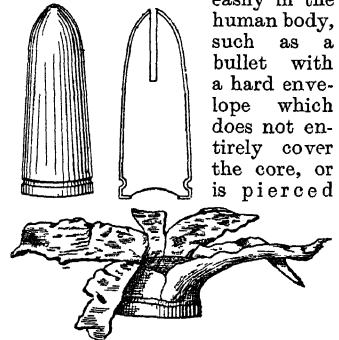
**Dumb-Bell.** Short iron or wooden bar with a knob at each end, used as an aid to health and by athletes as part of their training. Dumb-bells are grasped one

a fleshy, cane-like stem, about 6 ft. high, and oblong, deep green leaves spotted with white. The juice is acrid and poisonous. Old-time planters are said to have punished refractory slaves by compelling them to bite the stem, which rendered them speechless for several days, owing to swelling of the mouth parts.

**Dumbness.** Inability to articulate. It may be acquired, but in the vast majority of cases it is congenital. Acquired dumbness, although occasionally a symptom of mental disease or of an apoplectic stroke, is more often a manifestation of hysteria. The two Great Wars produced examples. Acquired dumbness may also be due to tumours, organic disease of the sound-producing apparatus, such as of the vocal chords, or complete paralysis of the chords following diphtheria. In the hysterical form the patient can cough loudly; in the other varieties coughing is impossible or feeble. Specialised psychological treatment is indicated for the hysterical variety. Recovery is usual from dumbness following diphtheria. Operation may restore the power of speech where dumbness is due to a tumour. If the whole larynx has to be removed, speech can be regained by wearing an artificial larynx.



**Dumbartonshire.** Map of this western county of Scotland; a small detached part lies between Stirling and Lanark



**Dum-Dum Bullet.** Top: the projectile, and sectional view showing cavity in the nose. Lower: the bullet after impact

with incisions. This class of bullet was invented to meet a demand for a projectile that would stop the rush of savages on whom the small-bore rifle-bullet of the ordinary type makes little impression. Controversy centred upon an invention of Captain Bertie Clay, of the ammunition factory at Dum-Dum, near Calcutta, and so the name has stuck to bullets, such as the official mark IV, which mushroomed on impact. This bullet actually shot better for having a cavity in the nose, but at Bisley, in 1899, it was pronounced to be dangerous to the firer, as the lead core separated from the envelope, and in the Boer War a return was made to mark II, the original cordite cartridge.

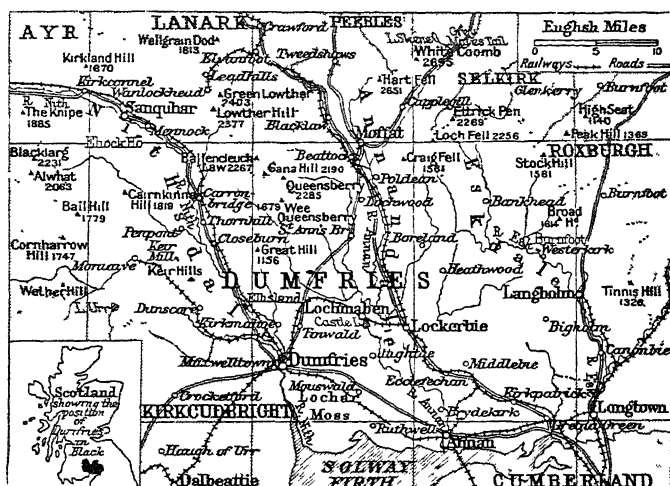
The first Hague Conference of 1899 prohibited the use of such bullets in any war between the signatories. Italy alleged that the Abyssinians used these bullets in the war of 1935-36. The development of air warfare led to considerable relaxations in the rule prohibiting both dum-dum and explosive bullets, and the Hague Air Warfare Rules of 1923, never, however, adopted, expressly allowed the use of such bullets against aircraft. See Bullet.

**Dumfries.** Royal, parl., and mun. burgh, river port and co. town of Dumfriesshire, Scotland. It stands on the Nith 74 m. S.E. of Glasgow by railway, and it is on the main trunk road from the South. In 1929 Dumfries, known as the Queen of the South, amalgamated with Maxwelltown, to which it is joined by four bridges, one built in the 13th century by Devorgilla, mother of John Balliol. Dumfries has its supply of electricity from the grid, as well as a surplus of water from its own water undertaking. It flourishes industrially, having factories for hosiery, spinning, and rubber products. Dumfries academy is a fine secondary school. Prominent buildings are the municipal chambers, the county buildings, and the Crichton Royal Institution for the Insane. A mausoleum was erected in 1815 in S. Michael's churchyard, containing the remains of Burns. There is a marble statue of the poet (1882) in front of Greyfriars



Dumfries arms

church, not far from the scene of the murder of Comyn by Robert Bruce in 1307. Market day, Wed. Pop. 25,000.



Dumfriesshire. Map of the south-western border county of Scotland, which has a coast-line of 21 miles along the Solway Firth

church, not far from the scene of the murder of Comyn by Robert Bruce in 1307. Market day, Wed. Pop. 25,000.

**Dumfriesshire.** Border county of Scotland, with coast-line of about 21 m. along Solway Firth. Hills (highest summit, White Coomb, 2,695 ft.) line the N., W., and E. boundaries, whence the surface declines to Lochar Moss, a marshy expanse in the S., now largely reclaimed. The county includes three sections—Nithsdale, Annandale, and Eskdale; these dales contain fine holms for pasture besides arable land. The rivers are well stocked with salmon and trout. Lochs Skene and Urr and the cluster around Lochmaben are the chief lakes; the first gives rise to the Grey Mare's Tail waterfall. Lead ore underlies the Lowther Hills in the N., and sandstone,



Dumfriesshire arms

limestone, and coal are worked. Agriculture is not extensively followed, but cattle and sheep are reared in good numbers on the abundant pastures. Moffat is visited for its mineral springs. The co. has good communications by road and rail. Dumfries (co. town), Annan, Langholm, Lockerbie, and Moffat are the largest towns. Gretna Green (q.v.) is in the S., near the border with England. One member is returned to parliament. Area 1,072 sq. m. Pop. est. 81,500.

**LITERARY ASSOCIATIONS.** Dumfriesshire claims many associations with Scottish and English literature from the time of Hector Boece or Boethius, the 16th century historian, who, like Ben Jonson, belonged to an Annandale family. James Crichton, the Admirable Crichton, was born at Elioock House, Sanquhar. W. J. Mickle, poet and translator of Camoens, was born at Langholm, and Allan Cunningham was born at Keir. The richest poetic memories of the county are associated with Burns, who passed the last eight years of his life at Ellisland, Sunnyside and Dumfries, where he died and is buried. The soldier author, Sir J. Malcolm, was born at Burnfoot, Westermark. Edward Irving was born at Annan. The greatest man of letters native of the county was Thomas Carlyle, born at Ecclefechan.

**Dumont, François (1751-1831).** French miniature painter. Born at Lunéville, he studied under Girardet, and became an academicien in 1788. Most of his miniatures are portraits, and include those of the



Dumfries. Weir built across the Nith to provide a water supply for grain mills

dauphin (Louis XVIII) and Madame Vigée Le Brun, both in the Wallace Collection. He also painted historical pieces in miniature.

**Dumouriez, CHARLES FRANÇOIS** (1739-1823). French soldier. He was born at Cambrai, Jan. 25, 1739.

At the age of 18 he entered the French army and fought in the Seven Years' War. Having been sent on a mission to Poland and Sweden, he fell into disgrace; was recalled, and imprisoned for some months in the Bastille. When the Revolution broke out, with Mirabeau he took the popular side, and became minister of foreign affairs. He resigned office to take command of the army of the north against the duke of Brunswick, whom he defeated at Valmy, Sept. 20, 1792, and on Nov. 6 he won another victory at Jemappes. In 1793 he was badly beaten by the Austrians at Neerwinden, March 18, but arrested the commissioners sent to inquire into his defeat. Accused of conspiring for the restoration of the monarchy—at least he had tried to persuade his troops to march against Paris—he took refuge with the Austrians, and for some years wandered about Europe with a price on his head. He finally settled in England, where he died near Henley-on-Thames, March 14, 1823.

**Dumper.** A lorry or truck which transports its load (usually soil, etc., after excavation) and discharges it mechanically ("dumping" it). By means of a hydraulic ram or a screw, the body of the vehicle is tipped to incline it to the rear or to one side, and the rear or side wall swings on hinges to permit the contents to discharge. Other dump trucks are fitted to discharge the load from the bottom. *See* Excavation.

**Dumping.** Originally, the act of throwing down a large quantity of material in a heap, as in shooting rubbish. In economics the term is applied to a practice adopted by some countries, *e.g.* formerly Germany, of producing goods in vast quantities with the assistance of bounties or tariffs, and then exporting them to other countries; thus flooding the market and underselling the manufacturers there with the object of killing their industry and securing control of the market.



Chas. F. Dumouriez  
French soldier

A series of Acts and finally the change in British policy from free trade to protection put an end to dumping in the U.K. The Safeguarding of Industries Act, 1921, introduced a customs duty—sometimes 33½ p.c., sometimes 50 p.c.—to protect "key industries"; *e.g.* optical glass, scientific instruments, and wireless valves. The Finance Act, 1925, imposed duties, usually of 66½ p.c., on motor cars, musical instruments, clocks, watches, and cinematograph films. These were known as the McKenna duties, having been originally introduced by R. McKenna as chancellor of the exchequer in 1915. The Import Duties Act, 1932, effected the final change, imposing a duty of 10 p.c. on all imported goods not specially exempted, and giving the Treasury power to impose additional duties on luxury goods and on goods likely soon to be largely produced in the U.K.

**Dun.** Celtic word meaning hill or fort. The dun was either a circular row of large stones on the top of a hill, or a regular building, known as a "Danish" fort, with a double wall. It is a common prefix in towns of the British islands, sometimes altered to dum-, don-, *e.g.* Dundalk, Dumbarton, Doncaster.

**Dunajetz.** River of Polish Galicia. Rising in the Carpathians it flows N. to join the Vistula. It is chiefly notable for battles in both Great Wars. On April 28, 1915, an Austro-German force under Mackensen began to drive the Russians out of the Cracow region. After desperate fighting on the Dunajetz and elsewhere, the outnumbered Russians made what was by May 11 a general retreat to the San.

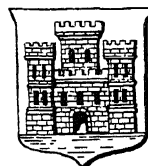
When Germany invaded Poland in 1939, two armies struck in the south through Silesia and Galicia. German forces captured Cracow on Sept. 6, and soon were beyond the Dunajetz and advancing on Lwow. In Jan., 1945, the 4th Ukrainian army took the offensive W. of Sanok, broke through strong German defensive systems, and advanced 50 m. in four days, forcing the Visloka and Dunajetz rivers.

**Dunant, HENRI** (1828-1910). Founder of the Red Cross. He was born at Geneva, May 8, 1828. Following the French and Sardinian armies as a doctor in the war against Austria in 1859, he was oppressed by the misery of the wounded at Solferino; and *Un Souvenir de Solferino*, published

1862, was a passionate appeal to all nations for protection of men wounded in battle. Supported by Napoleon III, Florence Nightingale, and Genevese citizens led by General Dufour, Dunant acted as secretary of an international conference which on Aug. 29, 1864, signed the Geneva Convention establishing the Red Cross. Getting into financial difficulties, Dunant found a home in a hospital at Heiden on Lake Constance, where he died Oct. 30, 1910, almost forgotten except that in 1901 he had been first recipient (with F. Passy) of the Nobel peace prize.

**Dunaverty.** Promontory and bay of Argyllshire, Scotland. It is 5 m. N. of the Mull of Kintyre. On the promontory there formerly stood a castle, belonging to the Lord of the Isles, which was several times besieged.

**Dunbar.** Royal and mun. burgh and seaport of East Lothian, Scotland. It stands at the mouth of the Firth of Forth, 29 m. E.N.E. of Edinburgh on the railway. A popular health resort, Dunbar has good golf and excellent bathing. It is one of



Dunbar arms

the driest and sunniest spots in Scotland. Of its two harbours the Victoria Harbour (W.) is a refuge for ships in distress. The herring fisheries are important, and other industries include rope and agricultural implement making. The old parish church has a notable carved pulpit and communion table. There are ruins of the old castle, captured by Edward I in 1296 and successfully defended against the English in 1338 by Black Agnes, the countess of Dunbar. The battle of Dunbar (*z.v.*) took place close to the town. These historic events indicate the strategic position of the town on the east coast route now followed by the rly. to Edinburgh. Market day, Tues. Pop. 5,062.

**Dunbar, BATTLE OF.** Fought Sept. 3, 1650, between the English and the Scots. Cromwell, seeking to crush finally the cause of Charles II, had invaded Scotland. With 16,000 men he approached Edinburgh only to find the Scots under David Leslie in a strong defensive position. Anxious to keep in touch with his supplies on board ship, Cromwell fell back to Dunbar. Then a second time he advanced to Edinburgh, but again

the Scots were in a strong position, and again he retired to Dunbar.

This time Cromwell was followed by the Scots. He encamped on Sept. 1, on the low ground near the town and the coast, while Leslie on the hills sent a force to bar the road to England. Sickness was rife among the English troops, who numbered barely 11,000 effectives as against 20,000 Scots, and their position was perilous when the Scots, urged on by the ministers who were with the army, left their position of vantage in order to attack.

The Scots at first stood with their backs to England, and between them and the English was a stream called the Broxburn. Cromwell opened the engagement before daybreak on Sept. 3, by sending some of his horse and foot across the stream. The Scots were not yet ready, so the English had time to take up a position with the sea behind them and the hills in front. The infantry under Monk advanced, as did the horsemen on either side of them; but the Scots, now fully ready, met their assault firmly. For a time there was no advantage, but at length Cromwell led up his reserves. This was decisive. The Scottish right broke, and the infantry in the centre was also routed, and the English horsemen came round their flank. The sun was only just rising when Cromwell called out "Let God arise, let His enemies be scattered." The Scots were followed as they fled, and altogether 3,000 of them were killed. About 10,000 more with their arms, artillery, and baggage, were taken. The English losses were slight.

**Dunbar, PAUL LAURENCE** (1872-1906). An American poet. He was born at Dayton, Ohio, to parents of pure negro descent who had been slaves. He earned his living as a lift boy and then as an assistant at the library of Congress, but later gave his whole time to writing. Oak and Ivy 1890, and Majors and Minors 1895, attracted the attention of W. D. Howells, who made them known to the American public and wrote an appreciative introduction to *Lyrics of Lowly Life*, 1896. Dunbar's best work is in his poetry, but he also wrote short stories and novels. A complete collection of his poems was published in 1913, seven years after his death from tuberculosis.

**Dunbar, WILLIAM** (c. 1460-c. 1520). Scottish poet. He is believed to have been born in East

Lothian and educated at St. Andrews. Becoming a member of the Franciscan order, he travelled as an itinerant friar through Scotland, England, and part of N. France. He entered the diplomatic service, which took him to Germany, Italy, and Spain. Between 1500-05 he received a pension from King James IV as court laureate, but was unsuccessful in his efforts to obtain a benefice. The king's marriage with Margaret, daughter of Henry VII, occasioned Dunbar's most famous poem, *The Thistle and the Rose* (1503). Dunbar is not heard of after the battle of Flodden; he may have fallen on the field, but was certainly dead by 1530.

His poems also disappeared about this time, to be discovered some 200 years afterwards by Allan Ramsay in a country house. His poetical genius, influenced by Chaucer, was many-sided; the rich allegorical poem *The Thistle and the Rose* is far removed from the grim humour of *The Dance of the Seven Deadly Sins*, or the serious pieces, such as *The Passion of Christ*. Lament for the Makaris and a tribute to London are well known. Dunbar's poems were edited by W. M. Mackenzie, 1933.

**Dunblane.** Town and police burgh of Perthshire, Scotland. It stands on Allan Water, 5 m. N. of Stirling on the railway. It has a hydropathic establishment and a mineral spa. Once the seat of a bishopric, its cathedral is one of the few which escaped destruction at the Reformation; restored in 1893, it is now the parish church. Robert Leighton, bishop 1661-70, is commemorated by the Leightonian library, Bishop's Walk and Bishop's Well. The Queen Victoria Military School (opened 1908) is 1 m. N. of the town, and the battlefield of Sheriffmuir (1715) is 2 m. to the E. Many of the people work in the woollen mills. Market day, Thurs. Pop. 4,421.

**Duncan.** City of British Columbia, Canada. It stands 42 m. N. of Victoria, Vancouver Island, on Cowichan river, and is served by rly. The centre of a residential, ranching, and farming district, it is near the Prince of Wales's Fairbridge Farm school of 1,000 acres in the Koksilah Valley. Pop. 2,189.

**Duncan** (d. 1040). King of the Scots. He succeeded his grandfather Malcolm II as king in 1034.

Little is known of him except that he was slain by Macbeth, thane of Cawdor, Cawdor Castle being the traditional scene of the crime. Shakespeare's version of the tragedy is based on legend.

**Duncan, ADAM DUNCAN, VISCOUNT** (1731-1804). British sailor. Born at Lundie, Angus, July 1, 1731, he entered the navy in 1746. He was present at the actions of the Basque Roads (1757), Goree (1758), and the blockade of Brest (1759). After his return to Great Britain



Viscount Duncan,  
British sailor  
After Hoppner

(1761) he saw no further service until 1778, when he was appointed to the Suffolk. In 1782 he became first lord of the Admiralty, and in the Blenheim took part in the relief of Gibraltar.

In 1795, promoted admiral, he hoisted his flag on the Venerable as commander-in-chief in the North Sea. In 1797 he blockaded the Dutch off Texel by a masterly piece of bluff, and on Oct. 11 obtained a decisive victory over the Dutch fleet off the village of Camperdown. For this he was created Viscount Duncan of Camperdown. He died suddenly Aug. 4, 1804. See Camperdown, Battle of.

**Duncan, SIR ANDREW RAE** (b. 1884). British industrialist and politician. Educated at Glasgow university, he held a number of industrial appointments, as vice-president of the Shipbuilding Employers' Federation, 1920-27; chairman of executive committee of British Iron and Steel Federation, 1935-40, and from 1945; chairman of Central Electricity Board, 1927-35. He was appointed a director of the Bank of England in 1929, and of Imperial Chemical Industries in 1939. High sheriff for the county of London, 1939-40, he entered parliament as National member for the City of London, and was minister of Supply, 1940-41 and 1942-45. Sir Andrew was chairman of a number of royal commissions, e.g. those which inquired into the Nova Scotia coal industry in 1925 and 1932, and the Sea-Fish Commission for the U.K., 1933-35.

**Duncan, ISADORA** (1878-1927). American dancer. Born at San Francisco, May 27, 1878, she passed her childhood in poverty, and at 21 appeared as a dancer at Chicago, without attracting much



Dunblane arms

attention. Struggling against severe hardships, she made her way to Europe with her family, determined to impress upon the theatre her personality and her ideals of dancing. These derived through nature from Greek art. Her dancing was a sincere expression of her own pagan temperament. In an age devoted to ballet, she acquired enthusiastic disciples, and through Fokine (*q.v.*) influenced the development of the Diaghilev ballet. She became famous throughout Europe and set up dancing schools in Paris, Moscow, near Berlin, and in the U.S.A. Her art failed to impress her fellow countrymen, and her last years were spent in unhappy circumstances in Europe. Two of her children were drowned in the Seine as result of a motor accident, and she herself was accidentally killed while motoring near Nice, Sept. 14, 1927, her scarf catching in the wheel of the car and strangling her. A biography by S. Stokes appeared in 1928; in the same year her autobiography was published.



Isadora Duncan,  
American dancer

**Duncan, Sir Patrick** (1870-1943). South African administrator. Born at Fortrie, Banffshire, Dec. 21, 1870, he was educated at George Watson's College, Edinburgh university, and Balliol College, Oxford. In 1894 he joined the board of Inland Revenue, where he became private secretary to Lord Milner. When the latter became governor of the annexed republics in South Africa, Duncan was appointed treasurer of the Transvaal, in 1903 colonial secretary, and in 1906 lieutenant-governor. Settling in South Africa, he practised as an advocate of the supreme court, and in the first election for the Union parliament was returned for a suburb of Johannesburg. In the administration of 1921-24 he held the portfolios of the interior, public health, and education, and in Gen. Hertzog's cabinet of 1933 was minister of Mines. Governor-general of the Union from 1936, his term of office was in 1941 extended for another five years, but he died July 17, 1943.

**Duncansby Head.** Promontory of Caithness, Scotland, the N.E. extremity (210 ft. high) of the mainland. Off the head are the Stacks, three small rocks, and

about 2 m. to the W. is John o' Groats' House.

**Dunciad, THE.** Satiric poem by Alexander Pope, first published anonymously, May 28, 1728. The poet, who had been vulgarly abused by hack-writers of the time, unmercifully retaliated on them in this poem.

**Duncker, MAXIMILIAN WOLF GANG** (1811-86). German historical writer. He was born in Berlin. Oct. 15, 1811, became professor of history at Halle in 1842, and sat as a Liberal in the Prussian legislature, 1849-52. Appointed professor at Tübingen, 1857, he resigned the post to enter the ministry of state in Berlin in 1859. He was director of the Prussian state archives, 1867-74. He died July 21, 1886. His chief works are *Origines Germanicae*, 1840; *Geschichte des Alterthums*, 1852-57, Eng. trans. in two portions as *History of Antiquity*, E. Abbott, 1877-82; *History of Greece*, S. F. Alleyne and E. Abbott, 1883-86.

**Dundalk.** Urban dist. and co. town of Louth, Eire. It stands on Castletown river, near Dundalk bay, 54 m. N. of Dublin by rly. At this important rly. centre there are railway locomotive works, and ironfounding, brewing, linen, boot and shoe making, tobacco and cigarette making are active industries; agricultural and dairy produce are exported. Market day, Mon. Pop. 15,466. Here in 1315 Edward Bruce proclaimed himself king, and was killed in battle in the neighbourhood in 1318. The town surrendered to Cromwell in 1649 and to Schomberg in 1689.

**Dundalk Bay.** Inlet of the Irish Sea. It penetrates the E. coast of Eire, co. Louth, about 6 m., and at its entrance between Cooley Point on the N. and Dunany Point on the S. its width is 7 m. It receives the waters of the rivers Dee, Glyde, Fane, and Castletown, and other smaller streams. The bay affords excellent anchorage in a depth of 4 to 6 fathoms. Several fishing villages stand on its shores.

**Dundas.** Town of Ontario, Canada. In Wentworth co.,

it is on Desjardines canal which connects with Lake Ontario, and is served by the C.N.R. Industries include heaviest iron working machinery and small tools, clothing, blankets, knitted goods, and chinaware. Pop. 5,276.

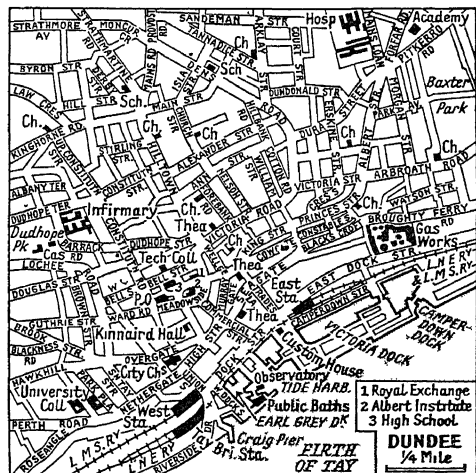
**Dundee.** Fourth largest city of Scotland (1940 official estimate); parl., royal, and co. burgh, and



Dundee arms

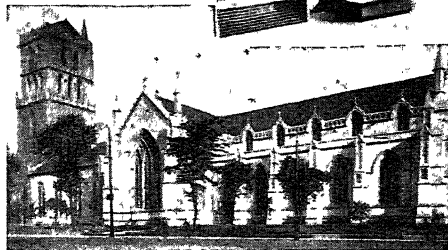
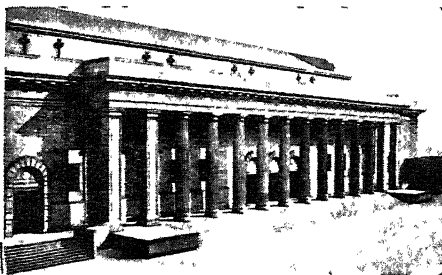
seaport of Angus. It stands on the N. shore of the Firth of Tay, 59½ m. N.N.E. of Edinburgh, and is well served by railways. The Tay Bridge opened in 1887 in place of an earlier structure destroyed in 1879, is 3,593 yds. long. Prominent buildings include the city chambers (1933), royal exchange (1853-56), custom house (1843). The Albert Institute, which commemorates the prince consort, contains the art gallery, free lending library, museum, and reference and commercial libraries. There are also a central reading room and sculpture gallery and five branch libraries situated in the various districts.

The Town Churches—three beneath one roof—are the most notable of many churches. Educational institutions are represented by the university college, founded in 1880 by Miss Baxter and Dr. J. B. Baxter, opened in 1893, and incorporated with the university of St. Andrews in 1897; the technical institute, endowed by Sir D. Baxter and opened in 1888; the high school with museum; Morgan and Harris academics.



Dundee, Scotland. Plan of the city, showing the chief public buildings and the docks

Dundee has a commodious harbour extending for 2 m. along the river, with a dock area of 38 acres. The annual trade of the port is about £7,000,000. The city is the centre of the Scottish jute industry, while its hemp and flax factories are among the most extensive in the world. Other industries include engineering, shipbuilding, dyeing, and fruit preserving, Dundee being noted for its marmalade. The largest public parks are Baxter Park, 37 acres; Balgay Hill, 36 acres; Lochee Park, 25 acres; and Caird



Dundee. The Town Churches : churches of S. Mary, S. Paul, and S. Clement under one roof, and the 12th century tower. Top, Caird Hall, built 1914-23

Park, 178 acres. Dundee Law, the hill in the centre of the town, is a landmark. Two members are returned to parliament. Market days, Tues. and Fri. Pop. est. 179,000.

Dundee (Lat. *Tuodunum*, hill or fort on the Tay) was besieged by Wallace in 1297, and sacked by the marquess of Montrose, April 4, 1645. In 1651 Gen. Monk burned the town and massacred a large number of the inhabitants. It was among the first Scottish towns to adopt the doctrines of the Reformation, and here Wishart preached during the plague epidemic of 1544.

**Dundee, JOHN GRAHAM OF CLAVERTHOUSE, VISCOUNT** (c. 1649-89). Scottish soldier. The eldest son of Sir William Graham, he belonged to the family that had acquired the estate of Claverhouse, near Dundee. He was educated at St. Andrews and served in France and Holland, distinguishing himself in 1674 at the battle of Seneff, where he is

said to have saved the life of the prince of Orange. He was sent as a cavalry leader to Scotland, 1678, with orders to enforce conformity to the established church, and by his relentless repression of the Covenanters earned the name of "Bluidy Clavers." In 1688 he was created Viscount Dundee by

James II. He was an ardent supporter of the Stuart cause, and was mortally wounded at the battle of Killierankie, July 27, 1689. The title became extinct when his son died in the same year. The use of "Bonnie Dundee" as an epithet for Graham dates from Sir Walter Scott's song, the original old ballad of that name being concerned solely with the town of Dundee. See Covenanters; consult also Lives, C. S. Terry, 1905; M. Barrington, 1911; G. Daviot, 1937; A. and H. Tayler, 1939.

**Dundonald, THOMAS COCHRANE, 10TH EARL OF** (1775-1860). British admiral. He was born at Annsfield, Lanark, Dec. 14, 1775, the eldest son of the 9th earl. In 1793 he entered the navy, and in 1801 he captured a Spanish frigate. In 1806 he became M.P. for Honiton and in 1807 for Westminster, and as a Radical became known by his denunciation of abuses in the navy. Having taken part in the attack on the French squadron in the Basque Roads, 1809, he contended that he had not been properly supported by Gambier, the admiral in command. A court martial was held, by which Gambier was acquitted and Cochrane consequently discredited.

In 1814 he was unjustifiably arrested with others in connexion

with a false rumour affecting the funds, and was sentenced to a year's imprisonment and a fine of £1,000. He was struck off the navy list, expelled from the house of commons, and ignominiously removed from the Order of the Bath. The amount of his fine was raised by popular subscriptions.

In 1817 Cochrane accepted the command of the Chilean navy and carried out a series of daring and brilliant exploits. In 1823-25 he commanded the Brazilian, and, in 1827-28, the Greek navy. In 1831 he became 10th earl of Dundonald and in 1832 was granted a "free pardon" for a crime which he had not committed and restored to his rank in the navy. In 1847 he was reinstated in the Order of the Bath. He was an early advocate of the use of steam in the navy, and was the author of the famous secret war plan, by which he claimed that he could destroy any fleet or fortress in the world. He died at Kensington, Oct. 31, 1860, and was buried in Westminster Abbey. Consult Dundonald's Narrative of Services in the Liberation of Chili, Peru, Brazil, 1859, and Autobiography of a Seaman, 1860.

**Dundreary, LORD.** Character in Tom Taylor's comedy, *Our American Cousin*, first produced in New York, 1858. Originally designed as a subsidiary part, it was so developed by its creator, E. A. Sothorn, that it became the chief character. Dundreary is a good-natured but foolish man of fashion, conspicuous for his side-whiskers.

#### Dundrum Bay.

Inlet of co. Down, N. Ireland. It extends from St. John's Point to distance of 9 m. Dundrum Harbour is on the N. of the bay. On St. John's Point is a lighthouse.

**Dune.** Hill formed of sand which has been drifted by wind action. Dunes are common in deserts and near sandy sea shores. Most dunes move under the influence of the prevailing wind, and in their steady progression may overwhelm villages and even



From an engraving  
*Dundonald*



Lord Dundreary, as impersonated by E. A. Sothorn



Graham of Claverhouse, Viscount Dundee  
After Lely

tinguishing himself in 1674 at the battle of Seneff, where he is



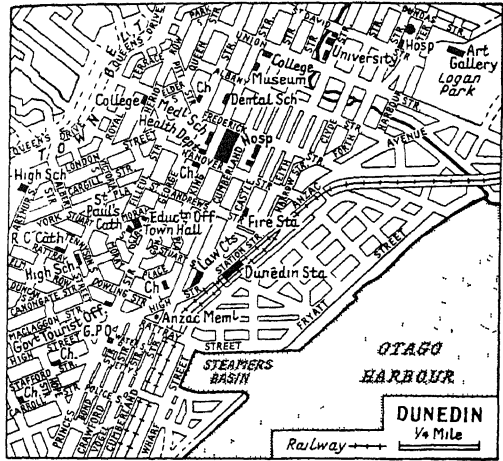
towns. Eccles Church in Norfolk was buried in 1839, in 1852 its tower reappeared, and now its foundations can be seen, the dunes responsible having moved on. Dunes may be anchored by planting them with coarse grass, trees, etc., or covering them with rubble. The size of dunes varies considerably. In S. Iran heights of 700 ft. have been recorded; many in the Libyan desert are over 300 ft. above their base.

Isolated dunes are usually crescentic in shape and are known as barchans. The horns of the dune point downwind, and the leeward (or concave) side is steeper than the windward. They move by the sands' being blown up the latter slope, whence it rolls or is carried by eddies on to the leeward surface, so building forward. Transverse dunes are elongated mounds which lie normally to the direction of the prevailing wind. Longitudinal or seif dunes are long ridges which broaden and rise to form chains of summits at regular intervals; they are remarkably constant in direction and range 60 or more miles. They often stand on whale-backs of sand up to  $\frac{1}{2}$  m. broad. Consult *The Physics of Blown Sand*, R. A. Bagnold, 1941.

**Dunedin.** City of South Island, New Zealand. Founded in 1848 by Scots settlers, who gave it the old Gaelic name for Edinburgh, it stands on Otago harbour, about 8 m. S.W. of Port Chalmers, and is the commercial and administrative centre of Otago prov. It has excellent communications by rail and sea, and there is an air service to Invercargill. A strip of open

country, known as the Town Belt, lies within the city limits. The manufacture of woollen goods, refrigerating works, boot making, foundries, and rolling mills are the chief industries. Dunedin is a great educational centre and has a university, technical college, and many public and private schools. Buildings include the Anglican and Roman Catholic cathedrals, the public library, art gallery, Queen Mary maternity hospital, and the university and early settlers' museums, the last-named housing the finest collection of pioneer relics in the dominion. Pop. 90,000.

**Dunedin, ANDREW GRAHAM MURRAY, VISCOUNT (1849-1942).** A British lawyer and politician. Born Nov. 21, 1849, he was the only son of the crown agent for Scotland. Educated at Harrow and Trinity College, Cambridge, he became an advocate in 1874 and a Q.C. in 1891. In the same year chosen M.P. for Buteshire, he entered the Unionist ministry as solicitor general for Scotland. In 1895 he was again appointed to that position, and in 1896 was promoted to lord advocate. During 1903-05 he was secretary for Scotland and a cabinet minister.



Dunedin. Plan of the city, which lies on Otago harbour, 15 miles from the open sea

In 1905 Murray left parliament to become lord justice general and lord president of the court of session, Scotland, and was made a peer as Baron Dunedin. In 1913 he was appointed a lord of appeal in ordinary, and in 1926 created a viscount. Retiring in 1932, he died Aug. 21, 1942, the peerage becoming extinct.

**Dunes, BATTLE OF THE.** Fought on the dunes outside Dunkirk between the French and the Spaniards, both supported by English contingents, June 4, 1658. To relieve Dunkirk, then besieged by the French, the Spaniards sent an army under Don John of Austria, one of its leaders being the great Condé. With it were five English, Scottish, and Irish regiments under James, duke of York. To aid France Cromwell had sent six regiments of his Ironsides.

The French were arranged in the conventional order of battle, cavalry on the wings and infantry in the centre, the English being on the left centre. The Spaniards had a line of infantry in front with the horsemen in column behind. On their left was the canal to Bruges, and the French stood with their backs to Dunkirk. The battle began with the advance of the English foot against the Spaniards' strongest position, a sand hill held by veterans. In spite of heavy losses they reached the hill and drove back the Spaniards. A few of the royalist English horsemen tried to save the day, but supports arrived for the Ironsides, and soon this wing of the Spanish army was completely broken. On the other wing, the Spaniards and their allies offered a poor resistance. The victory led to the fall of Dunkirk.



Dunedin, New Zealand. The Octagon, a central open space, with the Protestant cathedral, S. Paul's, and (right) the town hall

**Dunfermline.** Royal and mun. burgh of Fife, Scotland, on the Firth of Forth, 17 m. N.W. of Edinburgh. It gives its name to a parl. division. Since 1911 the burgh has been extended to include the naval base at Rosyth. It was a favourite residence of Scottish kings, and the Benedictine abbey, founded by Malcolm Canmore in 1072, was their burial place from the 11th to the 14th century.

#### Dunfermline arms

Charles I was born here. The ballad of Sir Patrick Spens opens: "The king sits in Dunfermline town." The abbey was partly demolished by Edward I, and except for the nave, which did duty as the parish church till 1821, was dismantled by the Reformers in 1560. In Pittencrieff Glen, which, with the estate and an endowment yielding £40,000 per annum, was presented to the burgh in 1903 by Andrew Carnegie, a native, are the ruins of Malcolm Canmore's castle and palace. The garden city between Dunfermline and Rosyth is a famous example of town planning. The town is celebrated for table-linen, and is also engaged in silk weaving. Market day, Tues. Pop. est. 37,600.

**Dungannon.** Urban dist. and market town of co. Tyrone, N. Ireland. It is 40 m. W. of Belfast by rly. It was the ancient residence of the O'Neills, titular kings of Ulster, who founded castles and an abbey of which no traces remain. There is a grain trade and linen and muslin manufactures. It returned two members to the Irish parliament, and from 1601 to 1885 was represented by one in the parliament in London. Market day, Thurs. Pop. 4,000.

**Dungaree.** Name given to a coarse Indian calico. From it comes the word dungarees, for a working garment of this material.

**Dungarpur.** Former Indian state, now in Greater Rajasthan, bounded N. by Udaipur. The surface is wild and rugged in the N. and E., the remaining portions being made up of jungle forest, stony

tracts, and a little arable land. The chief rivers are the Mahi and Som. Products are stone and timber. Dungarpur was founded as Vagad in 1179 by a scion of the house of Mewar. The ruler, called Maharawal, was entitled to a salute of 15 guns. The chief towns are Dungarpur (the capital), Sagwara, and Galliakot. Area, 1,460 sq. m. Pop. 274,282, Hindus and animists.

#### Dung Beetle

OR DOR BEETLE. Name given to species of *Geotrupes*, family Scarabaeidae. Several are common in Great Britain. They lay their eggs beneath dung, portions of which they carry down as food for the larvae, thus acting as scavengers. About 1 in. long, shiny black above, and metallic blue



Dung Beetle,  
*Geotrupes*  
*stercorarius*



Dunfermline. The New Abbey Church, built in 1821 on the site of the old abbey, of which a tower and some remains are seen on the right

beneath, they fly about at dusk in summer with a droning sound.

**Dungeness.** Low promontory on the S. coast of Kent, England. It has a lighthouse, coastguard station, Lloyds' signalling station, and small fort. It has been the scene of many wrecks, and off here Tromp defeated Blake in 1652 during the first Dutch war.

**Dunhill.** THOMAS FREDERICK (1877-1946). British composer. Born at Hampstead, Feb. 1, 1877, he entered the Royal College of Music in 1893 as a composition scholar. One of Stanford's most successful pupils, he was assistant music master at Eton, 1899-1908, and again during the Second Great War; he also taught at the R.C.M. The composer of one perfect song—a setting of Yeats's *The Cloths of Heaven*—he wrote also the music of the comic opera *Tantivy Towers*, 1931. Besides children's operas (e.g. *The Enchanted Gar-*

*den*) he wrote piano pieces, part songs, and arrangements of traditional songs. His orchestral works included a set of elegiac variations (in memory of Parry) and a symphony. In 1928 he published a critical work, *Sullivan's Comic Operas*. He died at Scunthorpe, March 13, 1946.

**Dunite.** Massive granular crystalline rock, a species of peridotite. It consists almost wholly of opaque olivine, with some chromic iron, and is named from Dun Mt., near Nelson, New Zealand, which is surmounted by this rock.

**Dunkeld.** Ecclesiastical and market town of Perthshire, Scotland. It stands on the Tay, here spanned by a seven-arched bridge, 15½ m. by rly. N.N.W. of Perth. The chief object of interest is the ruined cathedral, presented to the nation in 1918 by the duke of Atholl. This was built in the 11th or 12th century, but was partially destroyed at the Reformation. The ruins include a beautiful nave, a chapter house, and a tower, as well as the choir, which has been restored to serve as the parish church. Dunkeld is the seat of an R.C. bishop. Near is Dunkeld House, a residence of the duke of Atholl. The town has a modern town hall, and in the market square is a fountain commemorating a duke of Atholl. A mile away, across the Tay, is the village of Birnam. Pop. 946.

**Dunkers** OR TUNKERS (Ger., *dippers*). Sect of Baptists founded in Germany by Andrew Mack, in 1708. About 1720 they fled under persecution to America, where their leader, Conrad Peysel, founded a settlement at Ephrata, about 50 m. from Philadelphia. Men and women dwelt apart, marriage was forbidden, and strict vegetarianism practised. Divided into three sects, the Dunkers have numerous independent congregations in the United States of America.

**Dunkery Beacon.** Hill on Exmoor, Somerset, England. About 5 m. S. of Porlock, it is 1,707 ft. high, the highest point on the moor. It is 12 m. in circumference, its slopes are covered with trees, and on the summit is a large cairn. The lighting of the beacon on Dunkery is described in Lorna Doone.

**Dunkirk** OR DUNKERQUE. Seaport of France. It stands on the Strait of Dover, near the Belgian boundary, in the dept. of Nord. 40 m. N.W. of Lille. The flat district around it is called the *Watteringues*. One of the chief ports of France it lies in French Flanders; it has outer and inner harbours,

floating basins, dry docks, quays, and ample accommodation for shipping. Normally the port ex-



Dunkirk arms

ports the coal of Belgium and N.E. France, the manufactures of the industrial region therein, and the agricultural produce of other adjacent areas. Wool is a main import. Shipbuilding is carried on, while other industries include the manufacture

of machinery, soap, and shipping accessories. There are oil refineries, saw mills, and flour mills.

The old buildings include the church of S. Eloi, with a modern façade and a detached belfry, and the pilgrim chapel of Notre Dame des Dunes. The church of S. Jean-Baptiste was founded in the 15th century. The Place Jean Bart is named from a statue of the seaman of that name. Outside the old town are St. Pol-sur-Mer and Rosendaël. Malo-les-Bains is a watering-place. Pop. 10,575.

Dunkirk, meaning the church in the Dunes, was at first two small settlements around chapels named after S. Eloi and S. Gilles. It was taken and retaken by France and Spain, having passed to the latter country with the other lands of the duke of Burgundy. During 1653-62 it was in English hands. In 1713, by the treaty of Utrecht, its fortifications were pulled down, but later it again took its place as a seaport and a fortress. It was besieged by the English in 1793.

During the First Great War Dunkirk was heavily bombed by air and bombarded from sea and land.

After the withdrawal of the B.E.F. in 1940 (*v.i.*), Dunkirk became one of the German invasion ports and was frequently bombed by the R.A.F. In Sept., 1944, the British drive across Belgium to Antwerp isolated the German garrison at the port, who were penned into a perimeter roughly that held by the B.E.F. in 1940. An attempt to break out and cut the Allied line of communication was defeated on Sept. 8-9, but dense minefields held up the investing

troops. In Oct. a 60-hour truce was arranged for the evacuation of civilians, and the port was then subjected to an intense artillery and air bombardment. Czechoslovak troops contained the garrison until its surrender on May 11, 1945. The port was reopened in Aug., 1946.

On March 4, 1947, a 50-year treaty binding Great Britain and France in alliance for mutual protection against a revival of German aggression was signed at the sous-préfecture, Dunkirk, by Ernest Bevin and Georges Bidault, the respective foreign ministers of Great Britain and France.

## THE DUNKIRK EVACUATION, 1940

A. D. Divine, D.S.M., War Correspondent and Author

*One of the most significant episodes of the Second Great War is here described and assessed by a writer who was decorated for his own part in the Dunkirk operations. His book, Dunkirk, was published in 1946*

For all those who lived in Britain through the Second Great War, and for many others, the word "Dunkirk" signifies that astonishing series of operations which, in May and the early days of June, 1940, brought the British army back through Belgium and France with its allies disintegrating on either flank, and safe to the ports of England.

Dunkirk has been called a miracle. It was—a planned miracle, a masterpiece of desperate planning, of brilliant improvisation, of sheer genius in the handling of inadequate material.

By the German break-through along the Meuse on May 14 the British lines of communication, which ran transversely from Belgium across France to Le Havre,

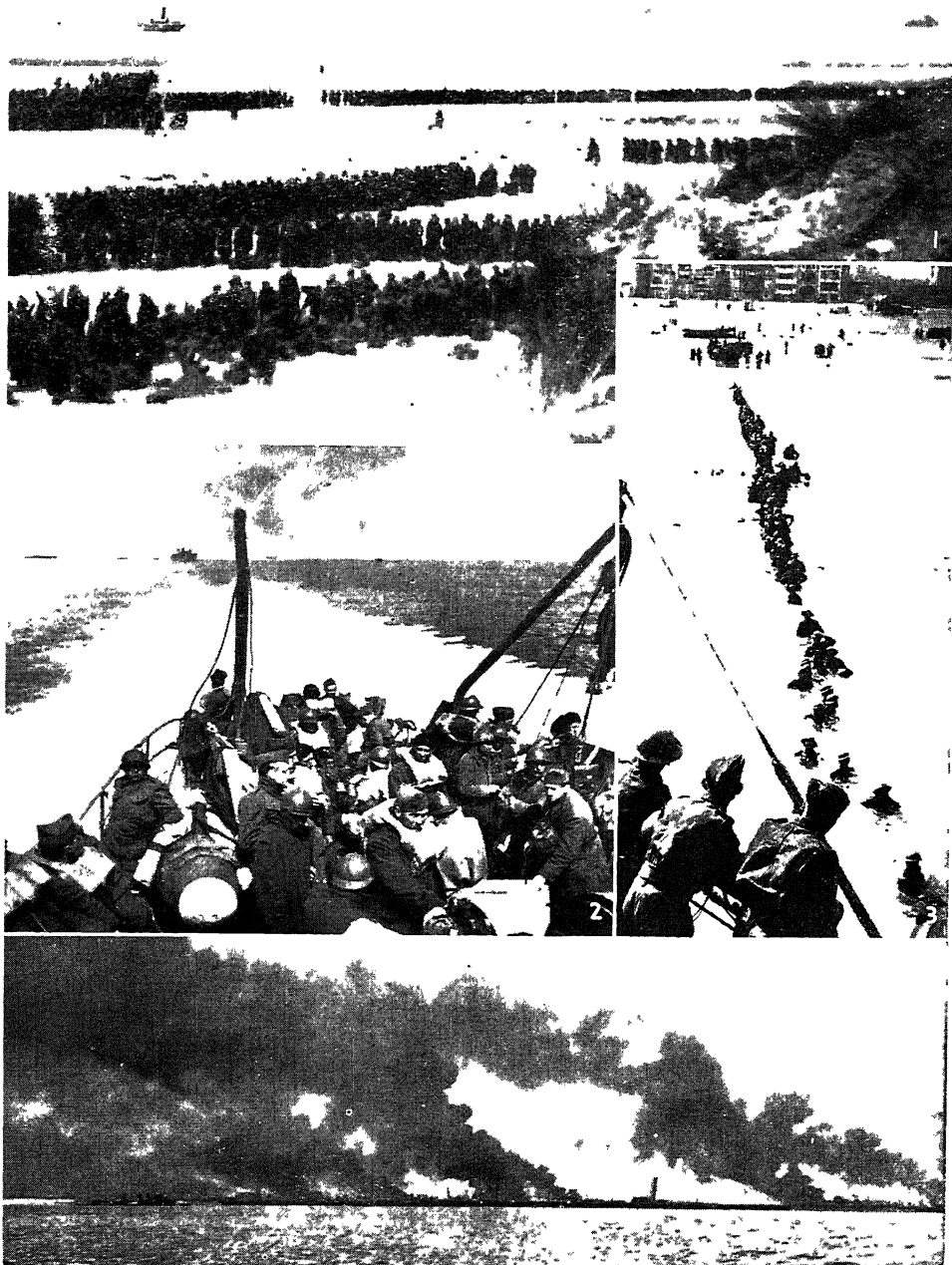
were endangered. On Sunday, May 19, the lines of communication were severed; German motor cycle patrols were descending on Abbeville, and Boulogne was already close to investment. By Monday, May 20, so swift was the turn of disaster, a plan for "emergency evacuation across the Channel of very large forces" was evolved, which envisaged the use of Boulogne, Calais, and Dunkirk. By the Thursday Boulogne had fallen, Calais was invested, and on the left flank the armies of Belgium were crumbling.

Operations in this area came under the Dover Command. The late Admiral Sir Bertram Ramsay, then Vice-Admiral, Dover, had assembled a nucleus staff of sixteen men. Working in one of the dynamo rooms in the subterranean tunnels of Dover Castle, they made a fresh plan and called it after the room in which they worked.

Admiral Ramsay had at Dover one flotilla of old "V" and "W" (1917) destroyers, the Channel minesweepers, a handful of armed yachts and miscellaneous small craft. On the transport side he had 15 cross-Channel and Irish Sea packets at Dover and in the Downs, and another 20 in reserve at Southampton. Behind these were the resources of the Admiralty and the ministry of Shipping. The ministry had carried out a rapid census of all suitable ships in British harbours. The Admiralty had initiated movements of ships from the north to reinforce Admiral Ramsay's thin flotillas. As early as May 14, the Small Vessels Pool had issued through the B.B.C. an order for all owners of



Dunkirk, France. The port after its reopening in August, 1946; reconstruction after the Second Great War had scarcely begun



1 British and French troops waiting in the sand dunes for their turn to be picked up and carried to England by one of the vessels of all sizes which rallied to the task of rescue 2 French troops on board a British

rescue ship, burning Dunkirk in the background 3 Men wading from shore to a rescue ship 4 Smoke and flame, from incessant German bombing and shelling envelop Dunkirk. Left, a rescue ship sinks

**DUNKIRK: WITHDRAWAL OF THE BRITISH EXPEDITIONARY FORCE MAY-JUNE, 1940**



**THE LIFTING OF BRITISH AND FRENCH TROOPS FROM DUNKIRK, 1940**  
*After the painting by Charles Cundall 'A.R.A.', an Official War Artist*

craft of 30 feet and upwards to lodge details of their ships.

On the black Thursday of May 23 the Germans overwhelmed the defence of Boulogne, and Admiral Ramsay lost seven of the eight ships of his Dover flotilla—sunk or damaged—in the magnificent heroism of that evacuation. On the afternoon of Sunday, May 26, the final decision to evacuate the British army was taken. At 6.57 p.m. Operation "Dynamo" was put into motion.

#### Fall of Calais

Two hours before, the Germans had overwhelmed the heroic resistance of the defenders of Calais and entered the citadel. The two armoured divisions that for four tremendous days had been held outside that battered port were free to throw themselves against the western flank of what was now to be known as the Dunkirk perimeter. On the eastern flank the Belgian armies, perilously short of ammunition, were beginning to disintegrate before the hammer blows of the German armour. The situation of the French, with a command divided, uncertain, and incompetent, was precarious in the extreme.

Boulogne and Calais, Ostend and Zeebrugge were lost. There remained Dunkirk; and a long series of raids, culminating in one of vicious fury on the Saturday night, had destroyed the port. In the 25 miles of long, straight sand beaches, shelterless, naked, exposed, between Mardyck Fort and Nieuport, there were only the two moles of the Dunkirk entrance channel. The eastern—the mole proper—was a narrow wooden structure barely wide enough for three men to walk along its decking—never designed for berthing ships. Off the beach along most of its length was a wide strip of shallows. Outside that lay the narrow Dunkirk channel, barely 800 yards of deep water before the outer sandbanks closed it from the sea. The entrances to that channel at the east and at the west were commanded by the guns of Nieuport and of Calais.

Admiral Ramsay's problem was to lift from those beaches 370,000 men. Nothing in all history, nothing in the long record of previous evacuations, matches the scale either of effort or of courage and determination that made Dunkirk possible. By Sunday the ships that the Admiralty had sent to replace Admiral Ramsay's lost Dover flotilla were already in operation. With them came more

ships—paddle-minesweepers from the south and from the east, trawlers, drifters, flak ships from the Thames, armed yachts and the rest. The work of Sunday afternoon showed the critical need of small craft to ferry men across the shallows to the channel. The Small Vessels Pool came into action in the Thames, the east coast, and the south coast ports. The ministry of Shipping supported it. By the Monday afternoon there had started that extraordinary procession of small boats to Margate, Ramsgate, and Dover that was to swell within forty-eight hours into the strange armada of deliverance.

Swept channels were organized and kept clear; patrols were provided against the E-boats that the Germans sent to harass the movement; the R.A.F. did what it could to provide a screen; and in a vivid crescendo of energy the totals rose. Less than 6,000 men were rescued on the Monday, yet by midnight on the Tuesday 45,000 men had already reached safety. In the next twenty-four hours 38,000 men were embarked. On Thursday May 30, the total was 45,955.

#### Casualties Among the Ships

Ships were lost to the shell fire of the forts and the mobile guns of Calais. Ships were battered and held up by the guns of Nieuport; they were hit by shellfire as they lay beside the mole; they were sunk by bomb, hit by low flying aircraft; they were lost in collision and to mines, and by wreck and stranding. The small craft on the beaches suffered with them; they were swamped by soldiers unused to the sea; they were ripped apart by bullets; always they were under the direct and deadly peril of the air.

By the Saturday the tally of disaster had grown so great—three destroyers were sunk within little more than an hour and four more damaged—that daylight loading had to be abandoned. Yet the night work was so brilliant, so swift, that the totals scarcely fell. Destroyers were carrying 1,400 men at a single trip; cross-Channel steamers as many as 3,000. When a signal from the Admiralty terminated Operation "Dynamo" on Tuesday, June 4, 337,000 men had come to safety. Of these, the 38 destroyers used in the operation carried 91,624. The Fleet minesweepers and the paddle-minesweepers between them rescued 49,780, the naval-manned Dutch skoots 20,284. The four main

naval categories alone lifted a total of 161,688, and to this must be added those taken off by the host of smaller naval craft. Of the Merchant Navy the cross-Channel steamers had the highest record—61,867 men in all. The French, with four cross-Channel ships, a handful of coasters and a small number of naval craft, rescued 30,000 men.

On the evening of May 28, Mr. Churchill had said in the House of Commons, "I expect to make a statement to the House on the general position when the result of the intense struggle now going on can be known and measured. This will not, perhaps, be until the beginning of next week. Meanwhile the House should prepare itself for hard and heavy tidings." The tidings he was able to give were instead a record of achievement that was the first great message of hope.

**Dunkirk.** City of New York, U.S.A., in Chautauqua co. A port of entry on Lake Erie, it is 40 m. by rly. S.W. of Buffalo. Besides being pre-eminent in the lake trade, it is the centre of an agricultural and grape-growing region. Industrial products include stainless steel, motor and aircraft parts, agricultural implements, locomotives, boilers, and radiators. There are oil refineries. Settled in 1809, Dunkirk was chartered as a city in 1880. Pop. 17,713.

**Dun Laoghaire.** Seaport and urban dist. of co. Dublin, Eire, formerly known as Kingstown after George IV, who landed therein in 1821. It stands on the S. side of Dublin Bay, 6 m. S.E. of Dublin, by rly. and tram. It is the port of departure and arrival for steamers between Eire and Holyhead and Liverpool. The harbour, begun in 1817, made it a port. Pop. 42,105. *Pron.* Dunleary.

**Dunlin** or **Ox Bird** (*Erolia alpina*). Species of shore bird belonging to the Sandpiper group. It breeds rather rarely in Great Britain, and is usually seen about estuaries. It is about 8 ins. long, and greyish coloured in winter, but in the breeding season the male is clad in chestnut and black.

**Dunlop, JOHN BOYD** (1840–1921). Scottish inventor. Born in Ayrshire, Feb. 5, 1840, he began to practise as a veterinary surgeon at Belfast. About 1888 the idea of an inflated tire occurred to him. This Dunlop tire was placed on the market by the Pneumatic Tyre and Booth's Cycle Agency. A patent was taken out for the wire edge attachment by the Dunlop Rubber



Co.; this expired in 1904. Dunlop died Oct. 23, 1921. See Cycling; Tire.

**Dunmore.** Borough of Pennsylvania, U.S.A., in Lackawanna co. Adjoining Scranton on the N.E., it is served by the Erie and other rlys. In an anthracite coal district, it has rly. workshops, and makes rail coaches, silk yarn, and bricks. Settled in 1783, as Buckstown, it was renamed in 1840 and incorporated as a borough in 1862. Pop. 23,086.

**Dunmore, JOHN MURRAY, 4TH EARL OF (1732-1809).** British administrator. Son of William, the 3rd earl, he succeeded to the title in 1756 and was a Scottish representative peer 1761-69. In 1770 he went to America as governor of New York and in 1771 Virginia also was placed under his authority. In 1774 he became involved in a struggle with the Indians, often called Dunmore's War, and a little later he carried on a civil war with the Virginians. He returned to England in 1776, and during 1787-96 was governor of the Bahama Islands. He died in May, 1809, at Ramsgate.

**Dunmow.** The name of two parishes in Essex, England. Great Dunmow stands on the Chelmer, 8 m. W. of Braintree by railway. Roman remains have been unearthed here. Market day, Tues. Pop. 2,882. Little Dunmow, also on the Chelmer, is 1½ m. S.E. of Great Dunmow.

**Dunmow Flitch.** Annual custom at Little Dunmow, Essex, of presenting a flitch of bacon to any married couple who can give satisfactory proof that they have not repented of their marriage for a year and a day after its celebration. Formerly the couple took an oath before the prior; nowadays a jury of neighbours is called. The custom was revived by Harrison Ainsworth, author of the novel, *The Flitch of Bacon*, 1854.

**Dunnage.** Loose planks of wood, matting, and other packing materials used in a ship's hold to pack the spaces between stowed cargo and prevent it shifting when the vessel rolls. In sailing ships dunnage was laid in the bottom of holds to raise the cargo above the bilge water.

**Dunne, FINLEY PETER (1867-1936).** American humorist. Born at Chicago, from 1891 to 1900 he attracted notice by contributing to the *Times-Herald*, of Chicago, a series of sketches in which, speaking as Martin Dooley, an Irish-American publican, he commented on social and political topics in

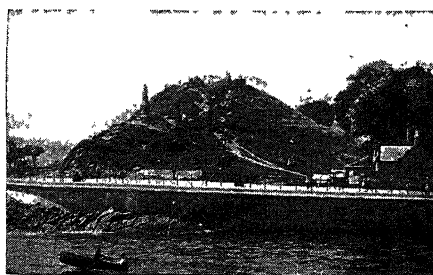
genially, sometimes pungently, humorous fashion. Dunne's works include *Mr. Dooley's Philosophy*, 1900; *Opinions*, 1901; *Observations*, 1902; *Dissertations*, 1906; *Mr. Dooley Says*, 1910; *On Making a Will*, 1920. He died April 24, 1936.

**Dunne, JOHN WILLIAM (1875-1949).** A British inventor and thinker. He was born in Ireland, Dec. 2, 1875, served in the South African war, and took up aeronautical experiments. He invented the aerofoil named after him and designed and built the first British military aeroplane. In 1906 he worked on balloons. He died Aug. 24, 1949.

His book *An Experiment with Time*, 1927, attracted much attention. From a detailed analysis of the dreams of his helpers, Dunne found that about half the matters dreamed of were in the past and half in the future of the dreamers. He argued that time has no reality, but that the conscious mind can perceive only a part of it; and claimed that if his reasoning held a fallacy no one had so far detected it. In *The Serial Universe*, 1934, he outlined the theory of serialism, with graphical illustrations.

**Dunn Laboratory.** Institution at the university of Cambridge devoted to the study of the scientific principles of nutrition. The laboratory was erected in 1929 by the Medical Research Council, which undertook the financial responsibility for its equipment and maintenance, the cost of the building being defrayed by a gift from the trustees of Sir William Dunn. The principal object is to investigate the physiology of human nutrition. Its first director was Dr. Leslie Harris.

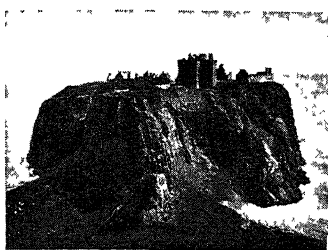
**Dunnottar.** Town and parish of Kincardineshire, Scotland. It stands on Carron Water, 1 m. S.W. of Stonehaven. At Dunnottar in 1793 Walter Scott met Robert Paterson, the stonemason original of *Old Mortality*. Pop. 2,255.



Dunoon. Ruins of the old castle and the statue of Burns' Highland Mary

Frith

**Dunnottar Castle.** Ruined stronghold about 2 m. S.E. of Stonehaven, Kincardineshire, Scotland. It is situated 150 feet above the sea, and dates from the 7th century. In one of its dungeons, known as Scotland's Black Hole or



Dunnottar Castle. Ruins of a stronghold besieged by Cromwell

Whigs' Vault, in 1685, during the Covenanters' rebellion, 167 men, women and children were incarcerated. Cromwell laid siege to the castle when he invaded Scotland, but did not take it until the Scottish crown jewels, placed in it for safe keeping, had been secretly removed to Kinneff Church. The castle was dismantled in 1720.

**Dunois, JEAN, COMTE DE (1402-68).** French soldier and popular hero. Born at Paris, Nov. 23, 1402, a natural son of Louis, duke of Orléans, and brother of Charles VI, he was known as the Bastard of Orléans. Originally intended for the church, he became a soldier, and first came into prominence by defeating the English and raising the siege of Montargis in 1427. His next exploit was the defence of Orléans, which he held until succoured by Joan of Arc, with whom Dunois now set himself to the task of clearing the country of the English. The task was not interrupted by the capture and death of the Maid of Orléans. The taking of Chartres in 1432 enabled Dunois to expel the English from Paris; by 1450 he had driven them from Normandy; and by 1455 Guienne was once more French. He died

at St. Germain-en-Laye, Nov. 24, 1468. A sympathetic portrait of Dunois is drawn in Bernard Shaw's play *St. Joan*.

**Dunoon.** Town and police burgh of Argyllshire, Scotland. It stands on the W. shore of the Firth of Clyde, 8 m. W. of Greenock. Formerly a small fishing village, it is now one of the most popular watering-places on

the W. coast. It includes Kirn and Hunter's Quay, and with these the town has a frontage of three miles on the firth. There is a statue to Mary Campbell, the "Highland Mary" loved by Burns, who was born here. The Cowal Highland gathering, which includes the contest for the world's pipe band championship, is held on the last Sat. in Aug. Hunter's Quay is the headquarters of Clyde yacht racing. Pop. 12,361.

**Dunraven Castle.** Seat of the earl of Dunraven, on the coast of Glamorganshire, Wales, near Bridgend. In 1946 the castle and park were leased for 21 years to the Workers Travel Association as a holiday resort.

**Duns.** Police burgh, county and market town of Berwickshire, Scotland, 55 m. S.E. of Edinburgh by railway. The original town of Duns or Dunse was situated on Duns Law (713 ft.), which has traces of the encampment set up by the Covenanters in 1639. Linen is manufactured and there is trade in flour and grain. Market day, Tues. Pop. 1,913.

**Dunsany, EDWARD JOHN MORETON DRAX PLUNKETT, 18TH BARON** (b. 1878). Irish author.



Born July 24, 1878, he was educated at Eton and Sandhurst, and succeeded to the title in 1899. He served in the S. African and the First Great Wars, and travelled extensively in the Far East. He was Byron professor of English literature at Athens university, 1940-41. A prolific writer of short stories, novels, and plays, his work was distinguished by a deep vein of fantasy and whimsical imagination. Earlier collections of stories included *The Gods of Pegana*, *Time and The Gods*, *A Dreamer's Tales*, *Tales of Wonder*, *The Charwoman's Shadow*, *Tales of Three Hemispheres*; among later publications the best known were probably the *Mr. Jorkens* series; *Up in the Hills*, 1935; *My Ireland*, 1937; *Patches of Sunlight* (autobiography), 1938; *The Story of Mona Sheehy*, 1939; *While the Sirens Slept*, 1944; *The Year*, 1946. His plays include *The Glittering Gate*, 1909; *The Gods of the Mountain*, 1911; *The Laughter of the Gods*, 1919; *If*, 1921; *Lord Adrian*, 1937. Of

*Dunsany*

his radio plays the most memorable were *Time's Joke*, *Atmospherics*, *The Aurora Borealis*.

**Dunsinane.** Peak (1,012 ft.) of the Sidlaw Hills, Scotland, 8½ m. N.E. of Perth. On it are traces of an ancient fort known as Macbeth's Castle. Shakespeare has immortalised the defeat here of Macbeth by Siward, earl of Northumbria, in 1054.

**Duns Scotus** (c. 1265-1308). Medieval schoolman. Little but legend exists as to his personal history. He is often referred to as a native of Duns, Berwickshire, but, as with Johannes Scotus Erigena (*q.v.*), his birthplace is variously assigned to England, Scotland, and Ireland. He appears to have been professor of theology at Merton College, Oxford, to have joined the Franciscans, and about 1304 to have gone to Paris, where, in contention with the Dominican upholders of the teaching of Thomas Aquinas, his dialectical skill won for him the name of Doctor Subtilis (the Subtle Doctor), and where he popularised the theory of the Immaculate Conception of the Virgin Mary, since 1854 a dogma of the R.C. Church. Sent to contend against the Beghards and Dominicans at Cologne, he died there, Nov. 8, 1308. His tomb, in the Minorite Church of S. Pantaleone, was inscribed: *Scotia me genuit, Anglia me suscepit, Gallia me docuit, Colonia me tenet* (Scotland bore me, England adopted me, Gaul taught me, Cologne holds me).

The writings of Duns Scotus testify to his familiarity with the works of Porphyry, Boethius, Aristotle, Plato, and the Arabian and Jewish schoolmen. They concern philosophical grammar, logic, metaphysics, and theology. His commentaries on the *Sententiae* of Peter Lombard are the more often referred to. The edition of his works publ. at Lyons in 12 vols., 1639, by Luke Wadding, an Irish Franciscan, is incomplete; another ed. appeared in Paris, 1891-95.

While his teaching appears to be no longer binding on Franciscans, his views have influenced modern theology and philosophy. To him theology was a practical

science, faith an act of will, and will the controller of the intellect. Though intentionally orthodox, his philosophy has its effects in modern materialism. An exponent of the inductive principle, he anticipated Bacon and Newton. In logic a quodlibetarian, one who, stating the pros and cons of an argument, leaves his hearers to draw their own conclusions, he influenced conceptualism.

From Duns Scotus and Thomas Aquinas arose respectively the schools of Scotists and Thomists, opposed especially in regard to the Immaculate Conception, and generally as to free will, grace, and kindred topics. The Scotist views were later adopted by the Jesuits. The term dunce, originally a Duns man, was applied as a term of contempt by Thomists to Scotists. See Aquinas; Concept; Nominalism; Realism; Scholasticism.

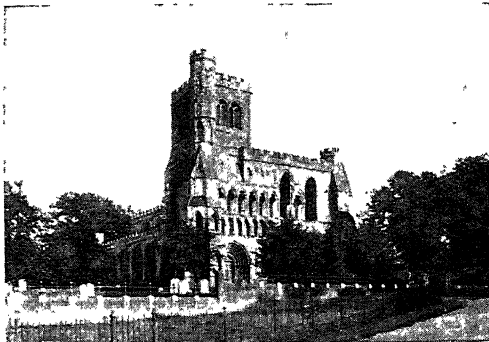
**Dunstable.** Mun. bor. and market town of Bedfordshire, England.

It stands at the entrance of one



Dunstable arms

of the gaps of the Chiltern Hills, 37 m. N.W. of London by two railway lines. The church of S. Peter and S. Paul is a part of the Augustinian priory founded by Henry I in 1131. Here Cranmer held in 1533 the court which dissolved the marriage of Catherine of Aragon. Dunstable is situated at the crossing point of Watling Street and Icknield Way, and is thought to have been a Roman station.



Dunstable. Parish church of S. Peter and S. Paul, part of the priory founded in 1131

Formerly a centre of straw plaiting, engineering, printing, rubber manufacture, and plastic products are among its industries. Market days, Wed. and Sat. Pop. 16,500.

**Dunstaffnage.** Ruined castle of Argyllshire, Scotland. It stands at entrance to Loch Etive, 3½ m.

N.E. of Oban, and dates from the 13th century. The traditional seat of the kings of Dalriada, it was wrested from the MacDougalls by Robert Bruce in 1308, and was garrisoned for the crown during the risings of 1715 and 1745. It figures in Scott's *Lord of the Isles*, and was for a time the prison of Flora Macdonald. The Stone of Destiny, which now forms part of the coronation chair at Westminster Abbey, reposed here before its transference to Scone.

**Dunstan** (c. 924-988). English saint, archbishop, and statesman. The son of a Wessex nobleman, he was born near Glastonbury and educated at its abbey. He went to the court of Athelstan and became a skilled musician, but, accused by rivals of practising the black arts, retired as a monk to Glastonbury, and is said to have worked in metal. He was made abbot c. 945. Chief adviser of King Edred, he was banished to Flanders by Edwy, c. 956, but on Edgar's accession his powerful career began; he was made bishop of Worcester 957, of London 959, and archbishop of Canterbury 960. Until the murder of Edward in 978, he was the chief counsellor at court and the moulder of ecclesiastical policy. He tried to reform monasteries according to strict Benedictine principles, rebuilt churches, encouraged literature and handicrafts. Historians utter no adverse criticism against Dunstan, and legends have gathered round his name. May 19 was the date of his death in 988 and is that of his festival.

**Dunster.** A market town of Somerset, England. Situated 23 m. N.W. of Taunton by the



Dunster, Somerset. Old wooden Yarn Market in the High Street

ry., just off Exmoor, it is a quaint old town, an architectural composition often photographed. Dunster Castle, owned until 1949 by the Luttrell family, dates from the 12th cent., and the Yarn Market, a wooden structure, from the beginning of the 17th century. Market day, Fri. Pop. 839.

**Dunsterville**, LIONEL CHARLES (1865-1946). British soldier. He was born at Lausanne, Nov. 9,



L. C. Dunsterville,  
British soldier  
Ellott & Fry

1865, and was educated at Westward Ho!, where he had a school-fellow Rudyard Kipling, who made him the hero of *Stalky and Co.* He joined the Royal Sussex Regiment in 1884 and was on active service in India and China. During the First Great War he held appointments in India and Mesopotamia (Iraq), and as a major-general commanded "Dunsterforce" in 1918, when he marched across Persia to Baku in an attempt to preserve the oil wells from Turks and Bolsheviks. He retired in 1920 and died at Torquay, March 18, 1946. He wrote *The Adventures of Dunsterforce*, 1920; *Stalky's Reminiscences*, 1928; *More Yarns*, 1931; *Stalky Settles Down*, 1932.

**Dunvegan.** Sea-loch on the N.W. coast of the Isle of Skye, Scotland, penetrating inland for  $7\frac{1}{2}$  m., with a breadth of  $2\frac{1}{4}$  m. On the E. shore is Dunvegan Castle, long the seat of the Macleods.

**Dunwich.** Coast parish and village of Suffolk, England. It stands on the North Sea,  $4\frac{1}{2}$  m. S.S.W. of Southwold. The chief town and harbour and at one time the only see of East Anglia (dating from the 7th century), Dunwich has suffered severely from sea encroachments, which at various periods swept away the palaces and houses and blocked up the harbour. The last remains of the ruined church of All Saints fell in 1920. Near by, on the edge of the cliff, are the ivy-clad ruins of a 13th century Franciscan priory. Pop. 174.

**Duodecimal** (Lat. *duodecim*, twelve). System of notation in which 12 and not 10 is the base. Duodecimal arithmetic is used for measuring builders' work and for computing areas in feet and inches. The group 12 is taken as the unit, representing 1 foot. Thus, with square measurement, the first component is 1 sq. ft.; the second component is one-twelfth of a sq. ft. and is termed the "part" or "prime"; the third component is  $1/144$ th of a sq. ft. and is called the "second." Further subdivisions are termed "thirds," "fourths," etc. When only the first three components are used they are called feet, parts, and

inches respectively. The notation is one tick after the numeral denoting the part, and two ticks after that denoting the second. Thus the linear measurement 9 ft.  $7\frac{1}{2}$  ins. is expressed as 9 ft. 7' 6", representing 9 feet, 7 primes, 6 seconds. The linear prime is equal to 1 inch; the linear second to one-twelfth of an inch.

In cubic measurement the prime is equal to 144 cu. in., and the second to 12 cu. in. The principle of subdivision by 12 thus applies throughout. Addition, multiplication, and division, are carried out directly without having to convert into decimal notation and then turn the figures back again into feet and inches. Proposals have been made to apply the duodecimal system more widely, and the convenience of such a method in dealing with British money calculations is claimed. To correspond with the duodecimal pence-shillings ratio, the half-sovereign would contain 12 shillings.

**Duodecimo** (Lat. *duodecim*, twelfth). Designation originally applied to a book each sheet of which was folded so as to make 12 leaves. Commonly it will measure 7 ins. by  $4\frac{1}{2}$  ins. The word is abbreviated 12mo or 12°. See Paper, Sizes of.

**Duodenum** (Lat. *duo-deni*, twelve each). Section of the small intestine. It is a fixed part of the alimentary canal, immediately next to the stomach, its fixity contrasting with the mobility of the stomach and of the rest of the small intestine. It is U-shaped, and its length is twelve fingers' breadth, whence its name.

Ulcers occur in the duodenum in two forms, acute and chronic. The acute form is a sharply cut hole in the lining of the gut. Every chronic ulcer begins acutely, but assumes a thicker rounded edge. It is not clear what causes the ulcer, although it is known that the condition is closely associated both with septic infection and with the acidity of the gastric juice. The ulcer usually forms where the acidity of the gastric contents of the duodenum is greatest, above the duct by which enter the alkaline, and therefore neutralising, bile and pancreatic juice. Septic infection may arise either by swallowing the germs or by way of the blood or lymph stream. The disease is more common among men than women, and appears to be due, at least in some degree, to worry.

Characteristic symptoms include periodical pain, often to the right

of the pit of the stomach, often going through to the back. It is felt two or three hours after food, and is often relieved by eating. In serious cases there may be internal bleeding, or the wall of the gut may be perforated, allowing the contents of the stomach to enter the abdominal cavity. Either condition demands immediate surgical treatment.

**Dupanloup, Félix Antoine Philibert** (1802-78). A French bishop. Born near Chambéry, Jan. 3, 1802, he was ordained priest in 1825. He was placed in charge of the Little Seminary at Paris in 1837, and founded the Academy of S. Hyacinthe. He energetically advocated freedom of education, and in 1849 became bishop of Orléans.

He became the leader of the Gallican party against the Ultramontanes, and strongly opposed the definition of the infallibility of the pope, though he submitted to the decree when it was promulgated. He was conspicuous by his self-denying labours during the siege of Paris. He died Oct. 11, 1878.

**Dupin, André Marie Jean Jacques** (1783-1865). A French jurist and statesman. Born at Varzy (Nièvre), Feb. 1, 1783, he is usually called the elder, to distinguish him from his two brothers, also eminent lawyers. In 1815 he opposed the proclamation of the young king of Rome as emperor. Elected to the chamber of deputies in 1826, he assisted in the revolution of 1830, and was made *procureur-général*. In 1832 he was president of the chamber and in 1848 led the young count of Paris into the chamber and proposed him for king. He eventually took office under the second empire, declaring that he "belonged to France, not to parties." His book, *Libertés de l'Eglise Gallicane*, 1824, was condemned by the Congregation of the Index at Rome. Dupin died in Nov., 1865.

**Dupleix, Joseph François** (1697-1763). French administrator. Born at Landrecies, Jan. 1, 1697, he was the son of a merchant. As a youth he went on voyages to India, where, about 1720, he settled. He was associated with the French East India co., trading also successfully on his own account. In 1730 he was made governor of Chandernagore, and in 1741 governor of Pondicherry, and chief official in French India.

The career of Dupleix in India is the story of a great plan thwarted. He saw the chance of



Dupleix. From the statue in Landrecies

France, and he took vigorous action. Repudiating terms arranged by his colleague Labourdonnais, he kept Madras, but failed in an attempt on Fort St. David. Then came the peace of 1748. Turning his attention to the Carnatic, Dupleix managed to depose one ruler, and set up another, and within a year his candidates appeared masters, not only of the Carnatic, but also of the Deccan.

The appearance of Clive changed the position entirely, the defence of Arcot in 1751 marking the turn of the tide. Unsupported by officials in France, Dupleix struggled on gallantly for a time, but in 1754 he was recalled to France, where he was allowed to live in obscurity and poverty until his death, Nov. 10, 1763. See Clive, Robert; India; consult also Lives, G. B. Malleson, 1890; E. Guérin, 1908; Dupleix et l'Inde Française, A. Martineau, 1928.

**Duplicate Bridge.** Variation of contract bridge, used for all tournaments and matches. In a duplicate game the same hands are played by all the competitors. They are normally dealt at the first table where they are to be played, and at the conclusion of a hand each player collects his 13 cards, lists them on a slip of cardboard to provide a check, and puts cards and slip into a slot on a board marked N., E., S., or W., according to his position at the table. Another slip records the result of the play at that table.

In a match for teams of four, the N.-S. cards will be held by one team at one table and the E.-W. cards by that team at the other

setting up there, by the aid of the natives and their constant rivalries, a great French empire, and he devoted considerable abilities to that end, the scheme including the expulsion of the English. In 1744 war broke out between Great Britain and

France, and he took vigorous action. Repudiating terms arranged by his colleague Labourdonnais, he kept Madras, but failed in an attempt on Fort St. David. Then came the peace of 1748. Turning his attention to the Carnatic, Dupleix managed to depose one ruler, and set up another, and within a year his candidates appeared masters, not only of the Carnatic, but also of the Deccan.

**Dupont, Pierre** (1821-70). French poet. Born at Lyons, April 23, 1821, he settled in Paris, and became a contributor of verse to periodicals. His *Deux Anges*, 1842, was crowned by the Academy. But his popularity, wide though transitory, was gained by his songs, many of them political, of which he wrote both words and music. He died July 25, 1870.

**Duppel.** Village of Slesvig, N. Germany. It stands on the mainland, opposite Sonderburg on the Danish island of Als. In 1848 and 1864 the Danes held it against the Germans. In the war of 1848-49 the Danes succeeded in keeping back their foes. In March, 1864, however, the Prussians laid regular siege, the final assault being delivered on April 18. It was successful, and many Danes were taken prisoners.

**Dupplin Moor.** Locality on the Earn, Perthshire, Scotland, the site of a battle fought Aug. 12, 1332. A party of Scottish nobles, among whom was Edward Baliol, deprived of their estates, took refuge in England. To recover their possessions they sailed from Ravenspur to Kinghorn. The Scots, under the earl of Mar, met them on Dupplin Moor, but their archers did such deadly work that the Scots fell back in disorder. The battle resulted in Baliol's temporary restoration.

**Dupré, Jules** (1811-89). French painter. Born at Nantes, April 5, 1811, he was the son of a potter,



Dupré. Typical landscape by Jules Dupré, French painter of the Barbizon school

who taught him to decorate his wares, but he was otherwise self-taught. His first landscape, a forest scene, was shown at the Salon of 1831, and he then began a life-long connexion with the Romantic group. His technique is imperfect, but he ranks high among the Barbizon school, excelling in his portrayals of the tragic aspect of nature. He died at L'Isle-Adam, Oct. 6, 1889.

**Dupuy, CHARLES ALEXANDRE** (1851-1923). French politician. He was born at Le Puy, Nov. 5, 1851, became a teacher, and entered politics as a Republican in 1885. He was thrice premier: April-Nov., 1893; May, 1894-Jan., 1895, this term including the murder of President Carnot; and Nov., 1898-June, 1899, a period of confusion owing to the Dreyfus case. In 1900 he was chosen senator for Haute-Saône. He died July 23, 1923.

**Dupuytren's Contraction.** A condition resulting from chronic inflammation of the palmar fascia, the dense fibrous tissues in the palm of the hand, leading to permanent flexion or bending of the fingers into the palm. It is most often seen in elderly males, and is sometimes associated with pressure on the palm caused by occupation. The disease may run in families. No cause is known. Surgical measures are the only form of effective treatment, but relief by cutting the fibres is usually followed by recurrence. The condition is named after Baron Guillaume Dupuytren (1777-1835), a French surgeon.

**Duquesne.** City of Pennsylvania, U.S.A., in Allegheny co. On the Monongahela river, it is 10 m. S.E. of Pittsburgh by the Pennsylvania rly. It manufactures iron and steel. Settled in 1885, it was incorporated as a borough 1891, chartered as a city 1917. Pop. 20,693.

**Duquesne, ABRAHAM, MARQUIS** (1610-88). French sailor. Born at Dieppe, the son of a naval officer,

he entered the merchant service, in which he saw much fighting in the war with Spain and won a high reputation. Peace having been signed with Spain, he obtained a



Marquis Duquesne, French sailor

high position in the Swedish navy, which he led to victory against the Danes near Gothenburg. Again in

France, he won glory in 1650 by compelling the surrender of Bordeaux. His greatest successes were his two defeats of the Dutch fleet in 1676—off Stromboli and in the Gulf of Catania, where de Ruyter lost his life, April 20. Duquesne died Feb. 2, 1688. *Pron.* Du-cane.

**Duralumin.** Important alloy of aluminium and one of the earliest heat-treatable non-ferrous alloys to be discovered (about 1909). Pure aluminium is not strong enough to be widely used for engineering work, but the addition of small amounts of other elements will give it properties similar to those of steel. A typical duralumin contains about 4 p.c. copper, 0.6 p.c. manganese, 0.6 p.c. magnesium, 0.5 p.c. iron, 0.5 p.c. silicon. As cast the alloy is brittle, but annealing at 350-400° C. softens it, so that it can be worked. More frequently it is forged, stamped, pressed, or rolled at about 450° C. Quenching keeps the copper, magnesium, silicon, etc., in solid solution; and the alloy remains soft and ductile. This solution, however, is supersaturated and, after ageing for some time at room temperature, the alloy becomes much harder because of precipitation of the minor constituents as compounds. Worked, quenched, and aged, duralumin will have a tensile strength about 27 tons per sq. in. and an elongation of 20 p.c. Its strength and lightness make it invaluable for aircraft construction. Resistance to corrosion is increased by coating with a thin layer of high purity aluminium. *See Alloy; Aluminium.*

**Dura Mater** (Lat., hard mother). Dense fibrous membrane which surrounds the brain and spinal cord. It is the outermost and the thickest of the meninges or three coverings of the brain. *See Brain; Meninges.*

**Durance.** River of France. It is formed by the union of three streams that rise in the Alps and unite near Briançon. It then flows in a S.W. direction through the departments of Hautes Alpes and Basses Alpes, afterwards forming the boundary between Vaucluse and Bouches-du-Rhône. It joins the Rhône below Avignon, its length being 220 m. The Durance is used to supply Marseilles with water. A canal extends from the river at Perluis to the city, a distance of 97 m.

**Durand, ASHER BROWN** (1796-1886). American painter and engraver. He was born of French

parentage at S. Orange, New Jersey, Aug. 21, 1796. Having studied art, he worked in painting portraits, history, genre, and landscape with fair success, and engraved Trumbull's picture *The Declaration of Independence*. He is known as the founder of the American National Academy. He died Sept. 17, 1886.

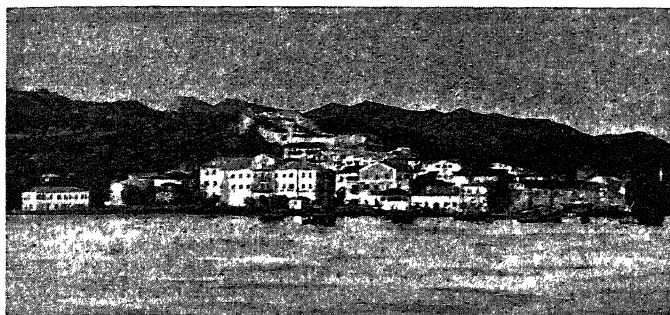
**Durango.** State of N.W. Mexico. It lies S. of the state of Chihuahua, and is mainly mountainous, paralleling the Sierra Madre, which penetrates the W. portion. Agriculture is carried on where possible, and timber, wheat, vegetables, cotton, and sugar are produced. The staple industry is mining, and silver, gold, copper, iron, and other minerals are worked, especially silver. Durango is the capital. Area, 42,272 sq. m. Pop. 483,829.

**Durango.** City of Mexico, the capital of Durango state. Originally called Guadiana, and sometimes known as Ciudad de Victoria, it stands in the Guadiana valley, 570 m. N.W. of Mexico city. The seat of a bishopric, it has a fine cathedral, a government palace, a public library, a college, and other buildings. A flourishing mining and commercial centre, its industrial establishments include cotton, woollen, sugar and flour mills, and foundries. Pop. 33,408.

**Durani.** Name bestowed by Ahmad Shah upon his native Abdali clan when establishing an empire in E. Afghanistan in 1747. It has since become the tribal name of the dominant Afghans. His attempted national fusion by associating Afridi, Mohmand, Orakzai, Yusufzai, and others under the appellation of Bar Durani failed.

**Duranty, WALTER** (b. 1884). Anglo-American journalist. Born May 25, 1884, he was educated at Harrow and Emmanuel College, Cambridge. He became Paris correspondent of the New York Times, and in 1921 went to Russia as correspondent of that paper. The ensuing years saw his daily dispatches and feature stories become widely popular, and he was awarded the Pulitzer prize in 1931 for the best piece of reporting of the year. His publications include *I Write as I Please*, 1935; *One Life, One Koppek*, 1937; *The Gold Train*, 1938; *The Kremlin and the People*, 1942, U.S.S.R., 1944.

**Durazno.** Dept. in Central Uruguay, S. America. It lies between the rivers Yi and Negro. The surface is diversified and the



Durazzo, Albania. View from the sea showing the landing place and, in the centre, the palace

soil fertile; many cattle, sheep, and horses are reared. Area, 5,525 sq. m. Pop. 95,148. The capital is San Pedro del Durazno, which is connected by rly. with Montevideo, 127 m. to S.S.E. It stands on the Yi. Products are grain and cattle. Pop. 15,000.

**Durazzo** or **DURRES**. Seaport of Albania, the ancient Dyrrhachium. It stands on the Adriatic, 60 m. S. of Scutari (Shkoder), and is now an inconsiderable place, but extensive ruins attest its former greatness. Founded 621 B.C. by Corinthian and Coreyean colonists under the name of Epidamnos, it was renamed Dyrrhachium by the Romans, who made it the port

opposite Brundisium on the W. side of the Adriatic, and later constructed from it the highway across the Balkans to Byzantium. In 1501 it passed to the Turks, who held it until 1913. On Good Friday, April 7, 1939, Italian troops landed at Durazzo during the invasion of Albania. Used as an Italian base port in the Italo-Greek war (Oct., 1940–April, 1941), Durazzo was bombed by the Allied air forces in 1940, during the Italo-Greek war, and in 1943. The town was liberated by Albanian partisans on Nov. 20, 1944. It is a port whose trade in oil, timber, and fruit is capable of much development. Pop. 8,739.

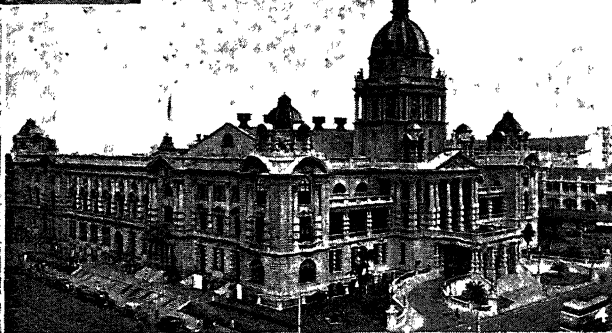
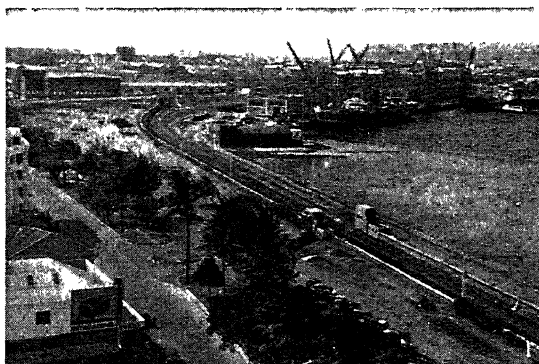
**Durban.** Commercial capital of Natal, S. Africa. The third largest city and the premier port in the Union, it is situated on the N. shore of a land-locked bay, and was founded in 1824 by the Dutch.

In 1835 it was occupied by British settlers, who named it after Sir Benjamin D'Urban, governor of Cape Colony. Covering an area of 70 sq. m., Durban is laid out on garden city lines and contains an impressive town hall, public library, museum, public gardens and parks, racecourses, magnificent promenade and marine drive, and is within easy distance of a number of fine bathing beaches. Durban is both a highly industrialised city and a popular holiday resort. Its harbour, 7 sq. m., ranks as one of the finest ports in the S. hemisphere. It is the chief port of entry for the rich gold centres of the Transvaal and Orange Free State, a gateway to the Natal hinterland, and the headquarters of a whaling industry.

During the Second Great War Durban was an important staging point to the Middle and Far East, particularly in 1942, when the

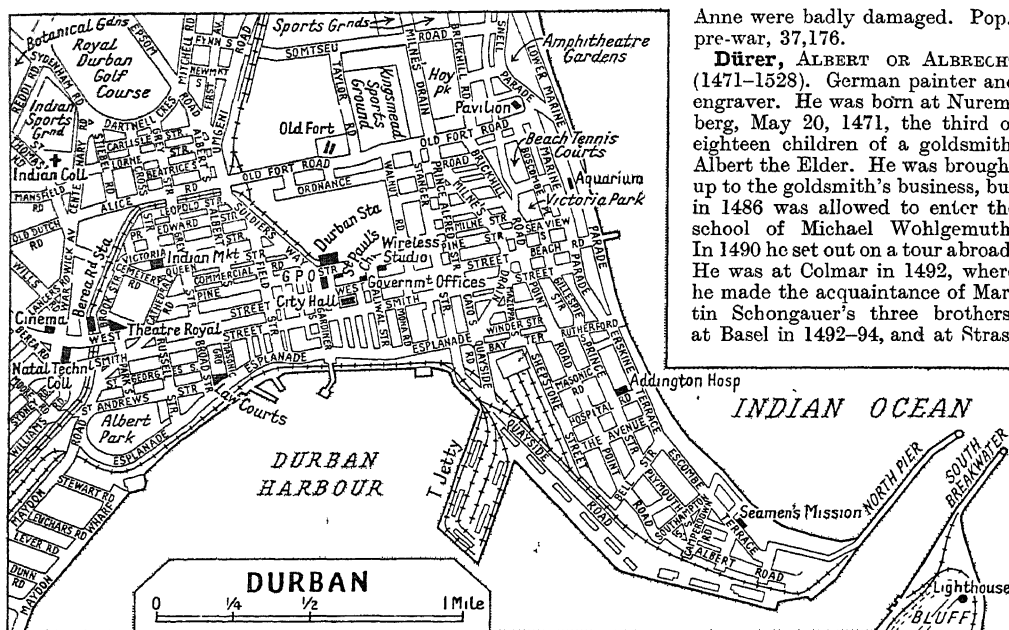


Durban arms



Durban, Natal. 1. Esplanade and docks of one of the finest ports in the southern hemisphere. 2. West Street, an important thoroughfare. 3. Post Office, with its clock tower. 4. City Hall, erected in 1910





Durban, Natal. Plan of the city. Most of it lies on the N. shore of a landlocked bay, reached by a 450-ft. wide passage between a low sandy spit and a bold cliff, the Bluff, whose summit is 195 ft. above sea level

Mediterranean was closed to Allied shipping. More than 500,000 British troops passed through the port during the war, a large proportion of them being temporarily accommodated in a vast transit camp at Clairwood on the outskirts. The harbour, turned into a first class naval base, docked and repaired 6,000 vessels ranging from merchantmen to battleships. Over 5,000,000 tons of cargo were handled yearly. A new aerodrome was built at Reunion, 8 m. S. of the city. Pop. 357,304 (European 124,792). See Africa in N.V.

**Durbar** (Pers. *dar*, door; *bar*, admittance, court). Term used in India for the court, council, or council chamber of an Indian ruler, for an official reception or audience, or for a great state ceremony. Specially magnificent durbars were held at Delhi on the proclamation of Queen Victoria as empress of India in 1877 and of Edward VII and George V as emperor in 1903 and 1911 respectively. The last was attended by King George and Queen Mary in person.

**Durbin, DEANNA** (b. 1922). A Canadian-born U.S. film actress and singer. Edna Mae Durbin was born at Winnipeg, Dec. 4, 1922. With an extraordinary voice for a child, she made an instant impression in a short film, *Every Sunday* (in which Judy Garland appeared), in 1937, and the same year was starred in *Three Smart Girls*. She

was allowed to play completely natural rôles in *A Hundred Men* and *A Girl and Other Films*, singing both grand opera and light ballads. From 1940 she became the conventional Hollywood heroine of musical films, but kept her popularity. She essayed more sophisticated parts in *The Amazing Mrs. Holliday* and *Lady on a Train*.

**Durchmusterung** (Ger., examination). Name for the modern telescopic star catalogues. Among the more famous are the Bonn *Durchmusterung*, which enumerates 324,189 stars (Argelander), and the Cape *Durchmusterung* (Schönfeld and Gill), comprising 454,875 stars.

**Düren**. Town of Germany, in North Rhine-Westphalia, on the river Roer, 20 m. E. of Aix-la-Chapelle (Aachen). Its industries are chiefly textile manufactures, including cloth, carpets, etc., but paper and iron goods are also made. It has been a chartered town since about 1300 and was of importance much earlier. It was part of the duchy of Julich, and became Prussian in 1815. In the Second Great War the town hall and the church of S.

Anne were badly damaged. Pop., pre-war, 37,176.

**Dürer, ALBERT OR ALBRECHT** (1471-1528). German painter and engraver. He was born at Nuremberg, May 20, 1471, the third of eighteen children of a goldsmith, Albert the Elder. He was brought up to the goldsmith's business, but in 1486 was allowed to enter the school of Michael Wohlgemuth. In 1490 he set out on a tour abroad. He was at Colmar in 1492, where he made the acquaintance of Martin Schongauer's three brothers, at Basel in 1492-94, and at Stras-

bourg in 1494; he returned to Nuremberg to find that a marriage had been arranged for him with the daughter of Hans Frey, this being celebrated on July 7. The story told by Pirkheimer, Dürer's intimate friend, as to the greedy, idle, and passionately jealous disposition of his wife Agnes is neither borne out nor contradicted by Dürer's silence in regard to his married life.

In the winter of 1494-95 Dürer made his first journey to Venice, which appears to have been unfruitful. His second visit was undertaken late in 1505, at the invitation of the Nuremberg merchants established in the city, who desired him to take part in the decoration of their bourse, the *Fondaco de' Tedeschi*. During his sojourn, which lasted till 1507, he was cordially received by the nobles, philosophers, and poets; less cordially by the painters, of whom only Giovanni Bellini gave him the hand of friendship. He began in Venice *The Feast of the Rosary*. On his return to Nuremberg he produced the following paintings at short intervals: single figures of Adam and Eve, 1507; The



*Albrecht Dürer*  
Self-portrait

Massacre of Ten Thousand Christians, 1508; The Virgin with the Iris, 1508; The Adoration of the Trinity, 1511. Between 1512-19 he was in the service of the emperor Maximilian. In 1520-21 Dürer made a journey to the Netherlands, probably to obtain the continuance by Charles V of the pension granted him by Maximilian. On his return he devoted himself to unceasing labour until his death on April 6, 1528. He was buried in the graveyard of S. John Nuremberg, and his house there was made a Dürer museum.

His friend Melanchthon said of the artist that his least merit was his artistic genius; and the friends he attracted to himself. Luther, Melanchthon, and the rest, suggest the attractiveness of his personality and the extent of his culture. Dürer was less a painter than a designer; his colour is more truthful to the model than original or beautiful. But in power of design, in nobleness of imagination, in his application of scientific theory to practice, in the introspective quality of his portraits, he has few, if any, equals. As a copper-plate engraver he is supreme; one can cite *The Arms of Death*, 1503; *Adam and Eve*, 1504; *The Great Horse and The Little Horse*, 1505; *The Knight, Death, and the Devil*, 1513; and the series of *The Passion*, not to be confused with the woodcuts of *The Great Passion* and *The Little Passion*. His famous woodcuts include the series of *The Apocalypse*, 1497; the 20 scenes of *The Life of the Virgin*, 1511; and a number illustrating the writings of



Albert Dürer. Examples of the artist's engraving. Left, *The Arms of Death*, 1503; right, *The Great Horse*, 1505. See also Drawing illus.

Maximilian I. Dürer also published *Four Books on Human Proportion*, 1528. See illus. to Book-plate; *Charlemagne*; *S. Christopher*.

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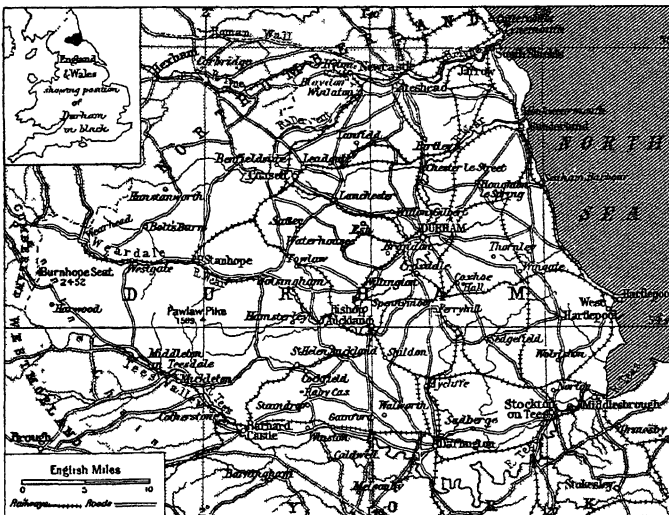
**Duress** (Lat. *duritia*, hardness). Term used in English law. It means compulsion by means of threats or imprisonment. The court will not allow anyone to retain the advantage of a gift or contract so obtained.

**D'Urfey**, THOMAS (1653-1723). English dramatist and song writer,

born at Exeter of Huguenot ancestry. His works comprise both tragedies and comedies, but the latter, which include *The Fond Husband*, 1676; *Squire Oldsapp*, 1679; and *Sir Burnaby Whig*, 1681, were the more popular. Like other dramatists of his time he was attacked by Jeremy Collier in his *Short View of the Immorality of the English Stage*. He was also a prolific writer of songs, of which two series were published, entitled *New Collection of Songs and Poems*, 1683; and *Wit and Mirth, or Pills to Purge Melancholy*, 1719-20. He won the favour successively of Charles II, James II, William and Mary, and Anne, but he died in poverty, Feb. 26, 1723. R. S. Forsythe published a study of his plays, 1916-17; C. L. Day of his songs, 1934.

**Durham**. County palatine and N.E. county of England. With about 33 m. of coast line, its area is 1,015 sq. m. Branches of the Pennine Chain, the highest summit of which is Burnhope Seat, 2,452 ft., enclose a series of fertile valleys in the W., whence the surface slopes away to the E. Immense coal-measures occupy the centre, annual production of coal being one-seventh of the U.K. total. The Wear, Tyne, and Tees, all navigable in part, are the chief rivers, and in the valley districts the soil is arable and well cultivated. In addition to coal, large quantities of lead, iron, limestone, millstone, granite, salt, etc., are obtained. The most attractive scenery is in the W., much of the central moorland being marred by industry.

Durham is noted for horses and shorthorn cattle, and sheep-rearing is carried on. Its manufactures include shipbuilding, sail-making,



Durham. Map of the coal-mining county of north-eastern England, notable also for its shipbuilding, ironworks, and manufacturing industries

and the production of chemicals, glass, woollens, and earthenware; there are also numerous blast furnaces, iron works, and machine shops.

Durham is the county town; the ports are Sunderland, Stockton-on-Tees, the Hartlepoons, Jarrow, and South Shields; other towns are Gateshead and Darlington. Apart from 8 for boroughs, the co. returns 10 members to parliament. Pop. 1,486,175. Durham formed part of the early kingdom of Northumbria. The regal authority of the bishops of Durham was finally withdrawn in 1836.

**LITERARY ASSOCIATIONS.** These start with the Benedictine monastery at Jarrow, founded by Benedict Biscop, but its greatest name is that of the Venerable Bede (*q.v.*), who was born near Wearmouth. Richard de Bury, author of *Philobiblon*, and bishop of Durham, died at Auckland and was

buried in Durham cathedral. At Stanhope, in Weardale, Joseph Butler, its rector, wrote *The Analogy of Religion*. Joseph Ritson, antiquarian writer, was born at Stockton; Elizabeth Barrett Browning at Coxhoe Hall. Scott's Rokeby has much about Barnard Castle and the upper Tees valley.

**Bibliography.** *The County Palatine of Durham: a Study in Constitutional History*, G. T. Lapsley, 1900; *Victoria Hist. of the County of Durham*, ed. W. Page, 1905-07; *Hist. and Antiquities of the County Palatine of Durham*, R. Surtees (1816-40), repr. 1908, etc.; Durham, A. Temple and G. Manley, 1942.

**Durham.** City, mun. borough, and county town of Durham, England. It stands on the river Wear, 287 m. N.N.W. of London, and has a railway station. The older part of the city is on and about a hill round which the river bends; the newer parts are on the other side of this.

The glory of Durham is the cathedral, and near it, on the river peninsula, is the castle. The present cathedral, which replaced an older one, was begun in the 11th century, and much of it is Norman; this includes the nave and the restored chapter house. The Galilee chapel

(*q.v.*) is a notable feature, as are the central tower and the chapel of the nine altars. There are a valuable library and some relics of S. Cuthbert. The cloisters and other parts of the monastic buildings still exist. The first castle was built by William the Conqueror, but little of this remains. Much of the present building, which is the headquarters of the university, is old, and some portions are highly interesting.

Other objects of interest in the city are some of the churches and the bridges across the Wear,

especially Framwellgate, of the 14th century. Elvet Bridge, leading to the suburb of Elvet, is also old, and on it are still a few houses. The churches include S. Margaret's, S. Oswald's, S. Mary le Bow, S. Mary the Less, and S. Giles. The town hall dates from the 16th century. The grammar school is an old foundation; its present house dates from 1844. At Ushaw is the R.C. college of S. Cuthbert.

The city lives largely on the business brought by the presence of a cathedral, a university (founded 1833 by Bishop Van Mildert), and the county headquarters. It has some industries, including the manufacture of carpets, organs, soft drinks, and confectionery; also printing. There are many coal mines in the neighbourhood. Durham has been a chartered town since 1179, and is governed by a mayor and corporation. It was represented in parliament by two members from 1673 to 1885, and one until 1918, when the representation was merged in that of the county.

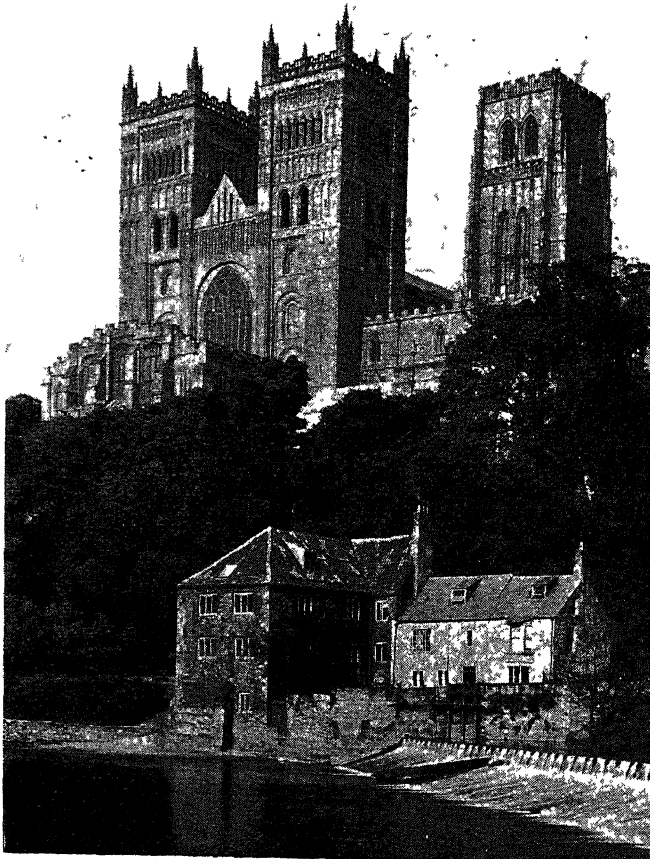
The city owes its origin to the monks of Lindisfarne, who looking for a place of safety.



Durham city arms



Durham. Sanctuary knocker at the cathedral



Durham. The cathedral, seen from across the River Wear. The Lancet and Perpendicular work of the two western towers, and that of the central tower, is imposed upon the original Norman architecture, among the finest of its period in England

Photochrom

considered this to be such, and settled here in 995 with the bones of S. Cuthbert. A church was built which became a cathedral, the bishopric being removed hither from Lindisfarne. Market day, Sat. Pop. 19,370.

**Durham.** City of North Carolina, U.S.A. The co. seat of Durham co., it is 26 m. by rly. N.W. of Raleigh. It is the seat of Duke university, founded 1924, and of several colleges. The centre of a tobacco and cotton growing region, it makes cigarettes and textiles, also fire escapes. Settled in the 1850s, it was incorporated 1867. Pop. 60,195.

**Durham, JOHN GEORGE LAMBTON, 1ST EARL OF (1792-1840).** British statesman. Born April 12, 1792, he was the son of William Lambton of Lambton Castle, Durham, to whose estate he succeeded as a child. From Eton he entered the army, but forsook that service for politics, becoming an M.P. for the county of Durham in 1813. Prominent among the Whigs, to which party his family had been long attached, he advocated parliamentary reform. His enthusiasm as a reformer earned for him the popular name of Radical Jack.

In 1828 Lambton was made a peer, and in 1830 entered Grey's cabinet as lord privy seal. He had a large share in drafting the Reform Bill of 1832 and in the negotiations that preceded its passage into law. In 1833, differing from several of his colleagues he left office, but still held a strong position in the country. He was ambassador at St. Petersburg (1835-37), and then went as governor-general to Canada, after the rebellion of 1837. It is his work thenceforward that has chiefly endured. He was armed with unusual powers, which he exercised freely, but the result was hardly satisfactory. Brougham attacked him for sending eight rebels to Bermuda, and parliament decided that the step was illegal. Unsupported by the cabinet, Durham had no course but to resign, and to return to England.

Durham then prepared his famous Report on the Affairs of British North America (1839), described as "one of the greatest state papers in the English language," and certainly one of the most influential. Therein he advised the union of the two Canadas, responsible government, the building of an intercolonial rly., and other liberal measures

afterwards approved and carried out. He died at Cowes, July 28, 1840. In 1833 he had been made an earl, and his successor was his son, George. The title is held by his descendant John Frederick Lambton, 5th earl (b. 1884, succeeded 1929). *Consult* Life and Letters, S. J. Reid, 1906.

**Durham, MARY EDITH (1863-1944).** British writer. Born Dec. 8, 1863, and educated at Bedford College and the Royal Academy of Arts, she illustrated the reptile volume of the Cambridge Natural History. Early in the 20th century she travelled widely in the Balkans; a champion of the Albanians, she yet criticised some of their customs and condemned the blood feuds of the northern clans. During the Balkan War, 1912-13, she did relief work in Albania, publishing an account of her experiences, *The Struggle for Scutari*, 1914. Her other books, authoritative history of the Balkans, include *Twenty Years of Balkan Tangle*, 1920; *The Serajevo Crime*, 1925; *Some Tribal Origins. Laws, and Customs of the Balkans*, 1928. She was a fellow of the Royal Anthropological Institute. She died Nov. 15, 1944.

**Durham Light Infantry.** British regiment, of which the two battalions were formerly the 68th and 106th regiments of light infantry. The former was raised in 1756 as a 2nd battalion of the 23rd regiment, becoming a separate corps numbered the 68th. Organized as a light infantry regiment in 1808, it was called the 1st battalion Durham Light Infantry in 1881. The battalion fought in the West Indies in 1761, and was granted the motto "Faithful" for its services against the natives in St. Vincent. It took part in the ill-fated Walcheren expedition (1809), in the Spanish campaign of 1811, in which it earned distinction at Salamanca and Vittoria, and in the Crimean War it fought at Alma and Inkerman.

The 2nd battalion, raised in 1826, served in the Mahratta War 1844, and the Persian War, 1856. Other important service included the Maori campaign, the Egyptian War, 1885, and the South African War, when it fought at Colenso, Spion Kop, Pieter's Hill.



Durham Light Infantry Regiment badge

The D.L.I. raised 37 battalions in the First Great War, and served in France, Italy, Macedonia, Egypt, and Archangel. Amongst the battle honours gained were: Aisne, 1914, '18; Ypres, 1915, '17, '18; Hooge, 1915; Loos; Somme, 1916, '18; Arras, 1917, '18; Messines, 1917; Lys; Hindenburg Line, and Sambre. A memorial to the regiment was erected at Warlencourt, near Bapaume, where one of its battalions put up a desperate resistance during the first battle of the Somme in 1916. The regiment helped to crush the attempted invasion of India by Amanullah, Ameer of Afghanistan in 1919.

D.L.I. served in all theatres of the Second Great War. In the North Africa campaign, units were attached to the 50th division and earned particular distinction at Gazala and Mersa Matruh. In the Italian campaign they were at the crossing of the Volturno, in the Monte Cassino attacks, and in the bitter battles of the Gothic Line. The regiment participated in the invasion of Normandy in 1944 and served throughout the campaigns on the Continent. The depot is at Newcastle-upon-Tyne.

**Durham University.** English institution of higher learning, founded in 1832. Its constitution was modified in 1908, when it was divided into two parts, one at Durham and the other at Newcastle-upon-Tyne. Originally it was a Church of England society, and the Durham division still remains so, its colleges being mainly occupied in preparing candidates for the Anglican ministry. These are University College, and three halls—Bishop Hatfield's, S. John's, and S. Chad's—and the dean and chapter of Durham are the governors. There is also a hostel for women students, and women are admitted to all degrees except the theological.

The Newcastle division consists of King's College, constituted in 1937 by the merger of Armstrong College with the college of medicine. The former was founded in 1874; the latter, dating from 1832, was united with the university in 1852, and removed to new buildings opened by George VI in 1939.

The university has seven faculties: arts, letters, theology, law,



Durham University arms

medicine, science, and commerce. Except theology and Oriental languages, King's teaches all the normal university subjects and is the only provincial university institution which adds to these all the six special subjects of fine art, architecture, Romano-British archaeology, agriculture, naval architecture, and mining. The concentration of university and hospital teaching in one central group of buildings at Newcastle was completed by the establishment of the dental department of the medical school and the dental hospital (founded 1895) in the grounds of the Royal Victoria infirmary. The buildings were opened in 1931 under the name of the Sutherland dental school. Instruction in forestry is given at Chopwell; there are two stations, Cockle Park and Offerton Hall, for agricultural research, as well as a marine biological station at Cullercoats. Codrington College, Barbados, is affiliated to Durham university.

**Durian** (*Durio zibethinus*) Large evergreen tree of the family Bombacaceae. It is a native of Malaya and the Indian Archipelago. The prickly fruit, as large as a man's head, is greatly esteemed by the Malays and Chinese, but for Europeans it is an acquired taste. At the right point of ripeness it is a sort of vegetable custard, and equal to the finest nectarines and pears. But it has an indescribable odour which fills many with disgust, though its flavour is most tempting to the palate.

**Durra.** Name for the seeds of Indian millet (*q.v.*), also known as Guinea corn.

**Durres.** Albanian seaport, described in this work under its Italian name, Durazzo (*q.v.*).

**Dursley.** Parish and town of Gloucestershire, England. It is 15 m. by rly. S.S.W. of Gloucester, and stands at the foot of the scarp of the Cotswolds. It makes Diesel and petrol engines, carpets, and agricultural and electrical machinery. Pop. 5,355.

**Duruy, JEAN VICTOR** (1811-94). French historian. Born in Paris Sept. 11, 1811, he became a professor at the École Henri IV, and produced in 1843-44 his *Histoire des Romains* (rev. and Eng. trans. 1883-86). Minister of public instruction 1863-69, he did much to reorganize the system of education, setting up the *conférences publiques* which still exist. Elected to the academy in 1884, he died Nov. 25, 1894.

**D'Urville Sea.** Portion of the Antarctic Ocean. It lies off Adélie Land, on the Antarctic Circle, in long. 140° E., and contains Commonwealth Bay. It was named after the French explorer, Dumont d'Urville (1790-1842), by the Mawson Antarctic Expedition of 1911-14.

**Duse, ELFONORA** (1859-1924). Italian actress. She was born in a rly. carriage near Venice, Oct. 3, 1859, to parents who belonged to a travelling company. At the age of four she appeared in *Les Misérables*; at 14 she played Juliet at Verona. Her first success came in 1878 and the next year she was a leading player in Rossi's company, winning at Florence further success as Frou-Frou. As Marguerite Gautier in *La Dame aux Camélias* at Rome, 1883, she was recognized as one of the greatest living actresses a reputation confirmed by her subsequent performances at Vienna, Berlin, London, New York, and in South America. Her finest impersonations, mostly tragic or highly emotional characters, included Magda, *La Tosca*, Santuzza in *Cavalleria Rusticana*, Mirandolina in *La Locandiera*, Paula in *The Second Mrs. Tanqueray*, Nora in *A Doll's House*, and the heroines in several of d'Annunzio's dramas written for her. She retired before the First Great War, reappeared in London in 1923, and died at Pittsburgh April 21, 1924. Among Lives, that by Arthur Symonds, 1927, may be noted.

**Dusius.** Demon among the ancient Gauls mentioned by S. Augustine. It was suggested by John Brand (1744-1806), in his *Observations on Popular Antiquities* that the exclamation, Deuce, commonly accepted as signifying the devil, is really derived from the name of this Dusius. See Demonology.

**Dussek, JOHANN LADISLAUS** (1761-1812). Bohemian pianist and composer. Born at Caslov Feb. 9, 1761, the son of a musician, he studied music at Iglau and Prague and gained a great reputation as pianist, composer, and

teacher. He was successively organist at Mechlin, Bergen-op-Zoom, and Amsterdam. After 1786 he was a fashionable pianist and teacher in Paris, and from 1790 to 1800 in London, which he left to avoid his creditors. He was afterwards in the suite of a Prussian prince and later in that of Talleyrand. He died March 20, 1812. The playing of Dussek was distinguished by its beauty of tone, and he was a prolific composer of music for the pianoforte. *Pron.* Dooshek.

**Düsseldorf.** City and most densely populated district of Germany. The city stands on the right bank of the Rhine, at the confluence of the Düssel, 24 m. N.N.W. of Cologne. Its importance in modern times was derived from two factors: it was first developed as an outstanding art centre under the Palatinate electors to whom it belonged until 1795, and then was chosen as a business and residential centre by industrial magnates of the Ruhr. The number of inhabitants grew from under 20,000 in 1815—when it was ceded to Prussia—to 213,000 in 1900, and 539,905 in 1939.

Around the old, inner town, with narrow, winding streets and picturesque remnants of the Middle Ages, Düsseldorf stretched in broad and impressive areas, with beautiful parks, including the Hofgarten, in a crescent of about 4 m. diameter round a bend of the river. Old buildings were the church of S. Lambert (1294-1394), a tower of the old ducal palace (1290-99), S. Andrew's (1622-29), the Reformed Church (1648), S. Maximilianus (1659), the town hall (1567, renewed 1737). But most of the buildings laid waste by numerous bombing attacks during the Second Great War were of modern origin; e.g. the Wilhelm Marx House, the first German skyscraper, the academy of art, art gallery, law courts, some 30 churches (mostly R.C.), branches of all the great banks of Germany, and administrative buildings of the big industrial combines.

Several huge bridges—all destroyed during the Second Great War—linked Düsseldorf with its western suburbs. Its wide squares and parks were adorned with good monuments, e.g. of Wilhelm I, Bismarck, Moltke, and of the painters Cornelius and Schadow under whom a century ago its art school won international fame. Düsseldorf was famous for its gay life, masked balls, and theatre; it owed much of its reputation to



Eleonora Duse,  
Italian actress



Düsseldorf, Germany. Pre-war air view of the city, showing the bridge over the Rhine which was built during 1896-98

its greatest son, the lyric poet Heine. Though it lost many art treasures when the electors moved to Munich, it still harboured a precious collection and held frequent exhibitions. Economically it was the heart of world-wide iron and steel industries, and had in its suburbs local industries in tubes, engineering, wood, chemicals, and food. It was because of their importance for armaments that Allied bombers nearly wiped out the city in the Second Great War.

Mentioned first in 1159, Düsseldorf was raised to a town by Count Adolf of Berg in 1288, and to a princely residence in 1511. It fell in 1609 to one of the Palatine counts, later electors, of whom Johann Wilhelm founded the art gallery and the new town, and Karl Theodor in 1767 created medical and law colleges, a library, and an academy of painting. It was captured by the French in 1795, and added to Prussia in 1815. The French occupied it 1921-25. Troops of the U.S. 1st army entered Düsseldorf, April 18, 1945. In 1946 it was designated capital of the new province of North Rhineland and Westphalia.

**Dust.** Name generally applied to the microscopic, insoluble particles dispersed throughout the atmosphere. These solid particles may be present as products of imperfect combustion of fuel, grains of sand swept up by winds from the desert, vegetable and animal residues, or mineral material from the disintegration of rocks in the earth's surface. An increase in the solid (as well as the liquid) content of the air produces an increase in atmospheric obscurity, which eventually results in haze or smoke fog. In perfectly clean air

objects above the horizon may be visible at distances up to 100 m.

Certain particles of matter act as nuclei upon which water vapour condenses with resulting formation of cloud and rain. In 1880, a Scotsman, John Aitken, devised an instrument to count the number of such nuclei present in air by utilising this discovery of the conditions necessary for change of state from vapour to liquid in the atmosphere. Measurements with Aitken's apparatus have since demonstrated that the numbers of these condensation nuclei vary over enormous limits. Four million per cu. cm. have been observed in a city, and only two for the same volume over the ocean. These nuclei consist of smoke and sea spray, as well as dust from the earth's surface.

Volcanic dust is composed of minute mineral fragments ejected during volcanic eruptions. Sometimes called ash, it comprises the pulverised forms both of lava and of sedimentary rock dislodged from vent-walls. The distance from the originating centre at which any particle settles on land or sea is determined by the relation of its mass and maximum elevation to the force and duration of the wind.

Dust from the great Iceland eruption of 1783 destroyed the crops in Caithness, Scotland. After the eruption of Soufrière, St. Vincent, in 1812, 3,000,000 tons of dust fell 100 m. away on Barbados in May. The Tomboro eruption in Sumbawa, 1815, distributed 50 cubic m. of material—185 times the mass of Vesuvius—over 1,000,000 sq. m. The most impalpable particles may float in the upper air for long periods, being indeed a predominant source of

atmospheric dust everywhere. At Krakatoa, Malay archipelago, Aug. 26-27, 1883, the dust-column, rising to 17 m., caused darkness for 150 m. around. Some of it completed the circuit of the earth in 15 days, and remained floating at high elevations for three years in a belt between 60° N. and 10° S., producing remarkable sunsets seen in all parts of the world.

Vast areas in Nebraska and Kansas, U.S.A., are covered with ancient volcanic dust up to 30 ft. thick. When such deposits, formed in geological time, are subsequently consolidated, they are called tuffs. Submarine eruptions are attended by similar phenomena, producing volcanic muds.

The inhaling of dust is responsible for chronic disease of the lungs and air passages, a condition termed pneumokoniosis, increasing susceptibility to tuberculosis. Those most frequently affected are miners, quarrymen, earthenware and pottery workers, cutlers, file makers, etc. The evil is reduced to a minimum by efficient ventilation, the use of hoods which prevent the dust from rising to the worker, or outlet shafts which draw it away as formed. In some processes it is possible to keep the dust down by sprinkling with water. The wearing of respirators is also of value. See Haze; Pollution. Consult Dust, S. C. Blacktin, 1934.

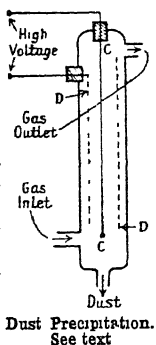
**Dust Bowl.** A region in the Great Plains of U.S.A., E. of the Rocky Mts., where the combination of a series of abnormally dry years and intensive ploughing has destroyed the original protective grass and humus cover and has laid bare the unconsolidated soil beneath to wind erosion. Somewhat similar conditions are found in parts of E. Africa, where large herds of cattle are destroying the grass cover, and also in Australia. See Soil Erosion.

**Dust Figures** OR LICHENBERG FIGURES. These are obtained by imparting an electrical charge to a point electrode located just above an insulating surface which is covered with a badly conducting powder such as lycopodium dust. The nature of the discharge from the point is made evident by the form assumed by the powder, and varies according to whether the point is positively or negatively charged.

**Dust Precipitation.** Term for the removal of dust particles in the waste gases passing up the chimney stacks of industrial plants, e.g. cement factories, mines, etc. A potential of about 50 kv. is main-



tained between a central conductor CC and a concentric conductor DD, and on becoming charged the dust particles are attracted to the electrodes. The latter are periodically shaken to loosen the precipitated dust, which is removed from the bottom of the stack as indicated in the diagram.



**Dust-storm.** A phenomenon produced by the passage of a very turbulent, though not necessarily very strong, wind over dry sandy or dusty soil. The arrival of a major dust-storm is usually marked by a wall of dust which may extend upwards for several thousand feet. In such storms visibility is greatly reduced. The distance to which dust derived from the desiccated surface of exposed soil is transported is determined by the force and duration of the wind. Local air-eddies which raise "March dust" are dust-storms in miniature. They especially characterise the dry desert-winds of wide, arid regions, occurring generally in thundery weather. The result of dust-laden wind-drift long continued is seen in such deposits as the clayey loess, sometimes 2,000 ft. thick, of N. China.

In central Asia the noonday sun is often obscured by fine, yellow loess-dust. On April 2, 1892, a dust-cloud, mostly of loess feldspar, covered 2,000 m., and was driven 400 m. out into the China Sea. The Sahara is another area subject to dust-storms. A storm of March 9-12, 1901, transported 1,800,000 tons of fine Saharan dust across Europe towards Russia.

In the Sudan the name *haboob* is applied to the whirling dust-storms which frequently occur. Amongst the winds which give rise to dust-storms are the *khamisin* of Egypt, the *sirocco* of the Mediterranean lands, the *harmattan* of N.W. Africa, and the *simmoom* of the African and Arabian deserts. See *Sandstorm*.

**Dusun.** Primitive people of Indonesian stock living in N. Borneo. Numbering 117,482, they form the largest sub-division of the Murut group. They have absorbed an immigrant Chinese strain, and adopted buffalo-drawn ploughs and irrigation. Tall, slender, long-headed, they are darker than the land Dyak of the Klemantan group.

**Dutch Auction.** Auction at which the property is offered at a price higher than the seller will accept. The price is lowered until a purchaser bids, when the lot is at once knocked down, or sold, to him at the sum last mentioned by the salesman. See *Auctioneering*.

**Dutch Church, THE.** Predominant Protestant church in the Netherlands. Holland was the first country in Europe to accept the principle of toleration for all forms of religion, and to subsidise out of the state funds all religious denominations which were willing to accept its bounty.

At the time of the Reformation Protestantism assumed the form of what is known today as the Reformed Church. From 1648 to 1795 it was recognized as the state church of Holland. After the Revolution all churches received equal recognition, but the Reformed Church never lost its prestige. It is the church to which the queen belongs. The constitution of the Dutch Reformed Church is based on the Presbyterian model. Each local congregation is governed by a consistory composed of deacons and elders. The local churches are grouped into 1,430 parishes and 44 *classes* or presbyteries. From these 10 provincial synods are formed, and in addition there is a general synod representing the whole country composed of 19 members, which acts as a final court of appeal.

The theology of the Dutch Church has always been Calvinistic, its creed having been based originally upon the Confession of Faith of the Synod of Dort, 1619; but strong humanistic philosophical currents from abroad managed to force their way into the actual theology of the church, as a result of which, though the majority of the members remained orthodox, a minority retained its position within the church only owing to the fact that the authority of the general synod was substituted for that of the scriptures. Schismatic movements ensued in 1834 and 1886, resulting in the establishment of the Reformed Churches of the Netherlands, essentially Calvinistic as to creed and organization.

The Dutch Reformed Church joined the other denominations in resistance to the Nazi occupation authorities (1940-45): in addition, it insisted that the prayer for the queen, as legal head of the church, should be used regularly. After the Second Great War, the general synod revised its opinion on its own

authority and decided to try to re-constitute the church on its original creedal basis. The church has over 2,700,000 members in the Netherlands, and its influence in the Dutch empire and in South Africa is extensive.

**DUTCH REFORMED CHURCH IN THE U.S.A.** The earliest Dutch settlers in America carried with them the religious principles of the Reformed Church founded in Holland after the Reformation, and a church was organized in 1628, gradually strengthened by the stream of immigrants.

The church was at first served by ministers from Holland, and was regarded as forming part of the presbytery of Amsterdam. In the 18th century, however, the American church sought and with some difficulty obtained its independence and its right to educate and ordain its own ministry. Some secessions took place as the result of the new policy, but the breach was subsequently healed, and in 1812 a constitution was adopted which still remains in force. In its polity the American church adopted the Presbyterian mode of church government used in the mother church in Holland (with some minor modifications), with its consistory for the local church, its presbytery or *classis* for the district, and its synod for the province. The doctrinal basis of the church is strongly conservative and Calvinistic, being based on no fewer than five creeds: the Apostles', the Nicene, the Quicumque Vult, the Belgic Confession (1561), and the canons of Dort (1618-19). The Heidelberg Catechism (1560) is used as a manual of doctrine, and acceptance of its statement is required of all seeking membership of the church. The Dutch Reformed Church has its main strength in New York.

**Dutch East Indies.** These former colonial possessions of the Netherlands are described in detail under *Indonesia*.

**Dutch Harbour.** United States naval and air base on Fox Island, one of the Aleutian group of islands, Alaska. On June 3, 1942, the Japanese raided Dutch Harbour from the air and did considerable damage. See *Aleutian Islands*.

**Dutch Liquid** or **ETHYLENE DICHLORIDE** ( $C_2H_4Cl_2$ ). Heavy oily liquid with a sweetish taste and pleasant smell, similar to chloroform. Discovered in 1795 by four Dutch chemists, it is prepared by the direct combination of ethylene and chlorine. It is a relatively



Examples of the kinds of picture most favoured by the school: portrait group, homely genre, landscape, coastal seascape, and cattle picture. 1. The Syndics of the Guild of Clothmakers, Rembrandt (Ryks Museum, Amsterdam). 2. Courtyard of a Dutch House, de

Hooch (National Gallery, London). 3. The Music Lesson, Metsu (Nat. Gall.). 4. The Forest, van Ruisdael (Louvre, Paris). 5. Village with Waterfalls, Hobbema (Nat. Gall.). 6. The Meadow, Paul Potter (Louvre). 7. Coast Scene—Calm, W. van de Velde (Nat. Gall.)

**DUTCH SCHOOL OF PAINTING: TYPICAL 17th CENTURY MASTERPIECES. See next page**

inexpensive solvent for oils, fats, waxes, certain resins, and gums, and when mixed with about one-third of its volume of carbon tetrachloride is used as a non-inflammable insecticide in vapour form. It has been used as an anaesthetic.

**Dutch Metal.** Alloy of copper and zinc, and therefore technically a brass. The proportion of the copper may range from 77.75 to 84.5 p.c. The colour varies from a pleasing pale yellow to a dark yellow, according to the proportions used. It is a very ductile metal and much used in the preparation of Dutch gold leaf, which is made by rolling down small cast bars to ribbon, beating under a steam hammer to a certain thinness, annealing, pickling in dilute sulphuric acid, boiling in solution of argol, washing and drying, and then beating with hand hammers, as in the manufacture of gold leaf proper. Dutch leaf is largely used for gilding purposes, being much cheaper than gold; while its colour can be preserved for a long time by painting with transparent lacquer. The colour is sometimes changed to red, violet, or green, or other shade by adding to the lacquer a small quantity of pure aniline dye. See Alloy; Brass.

**Dutch School of Painting.** Name given by critics and historians of art to describe particularly the Dutch painters of the 17th century. Their works, though varying greatly in quality, possess certain common characteristics distinguishing them from those of contemporary painters in other European countries, e.g. Italy or Spain, and indeed from Netherlands painting of earlier or later periods. This unique flowering of artistic genius was contemporaneous with, and expressive of, the sturdy growth of the Dutch republic. Individual painters with remarkable gifts of craftsmanship followed one another in almost bewildering profusion, each contributing something to the development of the "school." Yet by the 18th century the impulse had spent itself: not one Dutch painter of any note arose to take the place of the famous 17th century masters.

The thriving Dutch merchants, whose churches were plain and unadorned, lavished their love of beauty upon their homes; and the painters, who were their neighbours and fellow townsmen, were ready to paint, at a modest remuneration, suitable pictures for those homes. Thus, in contrast to

the great altarpieces and frescoes of the Roman Catholic countries, Dutch pictures tended to be small "easel" pictures intended for small rooms. Their subject matter was mostly restricted to homely themes based on the familiar life of the period and place, themes such as their purchasers best understood. The three most popular classes were local landscapes or seascapes; portraits, either of individuals or of official groups (*doelen* pictures), e.g. Rembrandt's *The Syndics* (see illus.); and scenes of everyday life in homes, courtyards, streets, farms, inns, and churches. Paintings in the last group are known as *genre* paintings.

In short, whereas in Italy art was the handmaid of the church and the wealthy noble, in the 17th century Holland it ministered to the pride of the bourgeois in his country, his house, and his possessions. The Dutch school neither attempted nor produced any great mythological, heroic, historical, or religious painting. Rembrandt's *Madonna and Child*, for example, is a literal representation of a Dutch peasant woman sitting by a Dutch crib, and is treated almost as objectively as his equally fine painting of a flayed ox hanging outside a butcher's shop.

Nor was there any encouragement to the painter to interest himself in purely aesthetic problems. Rembrandt's attempt to introduce artistic values into a *doelen* picture commissioned by a company of the Civic Guard was the initial cause of his financial disaster. Nevertheless, many painters of the Dutch school from Rembrandt and Vermeer downwards evinced an enthusiastic preoccupation with problems of *chiaroscuro* and the rendering of light, especially in painting interiors. For the rest, they were content to apply their superlative craftsmanship to an interpretation of life as their bourgeois patrons saw it.

Four men dominate the school: Rembrandt (1607-69), the greatest artist in paint the world has known: Frans Hals (1580-1666), whose portraits have a vitality and a mastery of technique which place him in a class by himself; Jacob van Ruisdael (1625-82), the most profound of landscape painters; and Jan Vermeer of Delft (1632-75), whose rendering of the subtleties of light in portrait, *genre*, and landscape, place him among the world's greatest craftsmen.

Other famous names are those of Gerard Terborch (sometimes called the "pocket Velazquez"), Gabriel Metsu, Pieter de Hooch, Jan Steen, Adrian Brouwer, Nicolas Maes, Gerard Dou, all *genre* painters; Albert Cuyp, Hercules Segers (originator of the "bird's-eye view"), Aart van der Neer, J. van de Capelle, Meindert Hobbema, all landscape painters; Ludolf Bakhuizen and Willem van de Velde, painters of seascapes and shipping; and Paul Potter, painter of cattle. They and many others have sometimes been known, from their limitations of scale and subject, as the "little masters." Biographies of most of them are in this encyclopedia.

Echoes of 17th century painting are discernible in the work of later Dutch painters, e.g. Josef Israels (1824-1911) and the three brothers Maris—Jacob (1837-99), Matthew (1839-1917), and William (1843-1910); but otherwise the later story of painting in the Netherlands is merged in the mainstream of European art history and no longer constitutes a particular school. Consult Dutch Painting, R. H. Wilenski, new ed. 1945. See illus. in preceding page.

Gordon Stowell, A.R.C.A.

**Dutch Wars.** Name usually given to three naval and commercial wars between England and the United Provinces (Netherlands) in the 17th century. The first, during Cromwell's government, broke out in spring, 1652, as a consequence of trade rivalry, the recently passed Navigation Act, the English insistence on the right of search, etc. It was notable chiefly for the exploits of individual commanders like Blake and Tromp. The Dutch suffered severely from the effects of blockade, but the war roused little popularity in England except in the fleet and the mercantile classes, and peace was concluded in April, 1654.

The second Dutch War, March, 1665-July, 1667, springing from similar causes, was remarkable for the English victory off Lowestoft in the four days' battle at the beginning of June, 1665, and the episode in which de Ruyter sailed up the Medway and burnt shipping in Chatham harbour. It gained in interest later through the diary of Pepys, at that time at the Navy office. By the treaty of Breda, New Amsterdam (subsequently renamed New York), captured in 1664, was confirmed in English possession.

Charles II committed England to the third Dutch War in March, 1672, according to the terms of his

alliance with Louis XIV of France. This war was even more disliked than the first: and pressure by the country interests in parliament brought about its conclusion in Feb., 1674.

**Dutch West Indies.** These former colonial possessions of the Netherlands are described under the headings Curaçao; Surinam.

**Dutra, ENRICO GASPAR** (b. 1886). Brazilian soldier and politician. After a distinguished career in the army, he became minister for war in 1937 under President Vargas. He was responsible for modernising the army and organized the expeditionary force which fought with the Allies in Italy in the Second Great War. In Dec., 1945, Gen. Dutra stood as Social Democratic candidate for the presidency and was elected by a majority of over 1,000,000 votes, the first president chosen by popular vote since 1926. His term was inaugurated Jan. 31, 1946. While a new Brazilian constitution was being drawn up, he governed by presidential decree.

**Dutt, MICHAEL** (1824-73). Bengali poet and dramatist, properly Madhu Sudan Datta. Born Jan. 25, 1824, at Sagandari village, Jessore district, Bengal, he was sent to the Hindu College, Calcutta, at the age of 13. Six years later, objecting to a marriage that was being arranged for him, he ran away, forsook his caste, and became a Christian. He then completed his education with four years at the Bishop's College. His first book, *The Captive Ladie* (1849), in English verse, though containing much that was remarkable in one writing in a foreign tongue, was less notable than his subsequent poetry written in Bengali. His *Sermista* (1858) and *Ratnavali* (1859) are the first examples of classical and regular drama in Bengali. Of both of these he made English translations.

His other poems include two great epics in blank verse, *Tillotama* (1860) and *Meghanad badh Kavya* (1861), the latter being described by a compatriot critic (R. C. Dutt) as the greatest literary production of its century. His name has become a household word among the people of Bengal, and he is by common consent regarded as the chief master in modern Bengali literature. He died June 29, 1873. *Consult*: *The Literature of Bengal*, R. C. Dutt, 2nd ed. 1895.

**Dutt, ROMESH CHUNDER** (1848-1909). An Indian statesman and author. Born in Calcutta, Aug.

13, 1848, and educated at the Presidency College, Calcutta, and University College, London, he was called to the bar at the Middle Temple, 1871. A member of the Indian civil service, 1871-97, he was the first native divisional commissioner. Of Baroda he became revenue minister, 1904-07, and prime minister, 1909. Made a C.I.E. in 1892 for his administrative and literary work, he was author of a *History of Civilization in Ancient India*, 1889-90; condensations in English verse of the *Mahabharata* (1899) and *Ramayana* (1900); books on the economic history of India; and a number of historical and social novels in Bengali. He died Nov. 30, 1909. *Consult* *Life and Work*, J. N. Gupta, 1911.

**Duval, CLAUDE** (1643-70). Franco-British highwayman. He was born at Domfront, Normandy, came to England at the Restoration in the train of the duke of Richmond, took to the road, and became notorious for his daring robberies and for his gallantry. He was captured while drunk in a London tavern and executed at Tyburn, Jan. 21, 1670. He was buried in Covent Garden church. Duval is the subject of a well-known picture by W. P. Frith.

**Duveen, JOSEPH DUVEEN, BARON** (1869-1939). British art patron. The son of Sir Joseph Duveen (*v.i.*), he was born Oct. 14, 1869. He became president of Duveen Brothers and a trustee of the National Gallery, the Wallace collection, and the Imperial Gallery of Art. He founded the British Artists' Exhibitions organization for the encouragement of less known British painters; the establishment of the Courtauld institute of art in 1930 was in part due to his generosity; he endowed a chair in the history of art at London university; and additions were made at his expense at the National Gallery and National Portrait Gallery. He was knighted 1919, made a baronet in 1926, and a baron in 1933. He died May 25, 1939, leaving no heir.

**Duveen, SIR JOSEPH JOEL** (1843-1908). An Anglo-Dutch art dealer. Born in Holland of Dutch parentage, he started as an antique dealer in Hull in 1865. In 1877, with his brother Henry, he founded in New York the art-dealing firm bearing their name. Opening in London in 1879, the firm quickly became noted for its discrimination and ability, among its famous purchases being the Kahn collection of old masters for nearly

£2,000,000. Duveen presented the Turner wing to the Tate Gallery (opened 1910), and many works of art to the national collections, and was knighted in 1908. He died at Hyères, Nov. 9 that year.

**Duveyrier, HENRI** (1840-92). French explorer and geographer. Born in Paris, Feb. 28, 1840, he travelled in the desert hinterland of Algeria and Tunis, reaching as far S. as El Golea and Ghadames (1859-61). This exploration work secured his appointment, in 1867, as secretary of the Société de Géographie. In 1874 he resumed his exploration of French N. Africa. His published works include *Exploration du Sahara: Les Touareg du Nord*, 1864; *La Tunisie*, 1881; *Le Transsaharien*, 1889-90; *Sahara Algérien et Tunisien*, 1905. He died April 25, 1892.

**Dux** (Lat., leader). Word sometimes used, especially in Scotland, for the head boy of a school.

**Dvina, NORTHERN.** River of Russia, in the northern region of R.S.F.S.R. It is formed by the union of the Sukhona and Yug. Flowing N.W. by Archangel, chiefly through level, marshy districts, it discharges itself into the White Sea by five mouths. It is navigable in summer throughout its entire length of about 460 m., but the shoals at the mouth are a nuisance to traffic. Fish abound, especially a kind of cod (*navaga*).

**Dvina, WESTERN, OR DUNA.** River of Russia. It rises in the lakes and marshes of the Valdai plateau in Kalinin region of R.S.F.S.R., flows S.W. and then N.W., across White Russia S.S.R., traverses Latvia S.S.R., and falls into the Gulf of Riga, 9 m. below Riga. It is about 640 m. long. As it forms a connexion with the Baltic and Black Seas through the Beresina canal it is used for timber transport, partly floated and partly by boat.

**Dvina, BATTLES OF THE.** Fought between Russians and Germans, 1915-16. The first battle took place Aug.-Sept., 1915. The German armies arrayed against the Western Dvina belonged to the army group commanded in person by Hindenburg. Mitau (Jelgava) had been taken on Aug. 1, and on Aug. 5 the Germans were only 10 m. from Riga, and preparations for evacuating the city were being made. A naval attack on the port was definitely repulsed by Aug. 21, and all attempts on the land side failed, but the Germans, after heavy fighting, moved forward towards Jacobstadt and Daugavpils (Dvinsk). They were

driven back, but were advancing again on the 24th. About Aug. 28 Below (*q.v.*) began a great assault on the line of the Dvina, with Friedrichstadt as his chief objective.

On Sept. 2 German cavalry stormed the bridgehead near Lennewaden, N.W. of Friedrichstadt, and next day the Russians were found to have withdrawn from the Friedrichstadt bridgehead. S. of that town the Germans advanced towards Jacobstadt, stubborn actions being fought. By about Sept. 13 the battle had died down, the Russians withdrawing to Podbrodzie, the purpose of the Germans being to participate in the operations against Vilna.

The second battle was fought during Jan.-Aug., 1916. At the beginning of the year the Russian line was virtually that established at the end of Sept., 1915, after the Russian retreat from Warsaw. On May 11 Hindenburg launched an ambitious but abortive offensive against the Russian positions at Selburg on the Mitau-Jacobstadt rly. Another attack was launched at the beginning of June against the sector to the S. of the station of Neu Zelburg, N.W. of Jacobstadt. Henceforth Galicia became the critical area of the Eastern front, and with the repulse of a Russian attack in the Divina sector at the end of Aug. the second battle died down.

Germany attacked Russia on June 22, 1941, one offensive having Leningrad as its objective. Advancing through the Baltic States the invaders stood on the Dvina between Daugavpils and Riga on July 1. A fierce battle ensued for the river crossings, which were forced on July 3-4. The Russians held the line of the river in the Polotsk sector until July 11, when they withdrew to avoid encirclement, Vitebsk being captured by German units next day.

In the Russian summer offensive of 1944, five German divisions were encircled and annihilated at Vitebsk, the town being stormed by Russian troops on June 26. The principal bridges over the Dvina were captured intact; and Polotsk was seized on July 4, after bitter fighting. The German positions on the Dvina were turned, and two Russian armies drove towards the Baltic and East Prussia. Daugavpils fell on July 27, but there was heavy fighting on the N. bank of the Dvina during the Russian drive for Riga, captured Oct. 13;.

**Dvinsk.** This town of Latvia S.S.R. is described in this work under the name Daugavpils.

**Dvorak, Antonin** (1841-1904). Czech composer. The son of an innkeeper, he was born at Nelahozeves, near Prague, Sept. 8, 1841. He received his musical training at the organ school in Prague, and in 1862 joined the orchestra of the national theatre, but resigned after



Antonin Dvorak, Bohemian composer

the success of his Hymnus in 1873. Inspired by the example of Smetana, Dvorak turned to the rich sources of Bohemian folk music, and through the influence of Brahms, always an admirer, was invited to write a set of Slavonic dances, which established his fame abroad. From 1883 his music became popular in England, and he made five visits to this country, 1883-1891, conducting performances of his Stabat Mater, Requiem, and the symphonies in D minor and G major.

In 1892 he accepted the directorship of the conservatory of music in New York, staying three years. The symphony in E minor (From the New World), first performed at New York Dec. 16, 1893: the string quartet in F major, the quintet in E flat, and the concerto for cello and orchestra, 1895, belong to this mature period. But Dvorak had an extreme simplicity of nature and was never happy for long away from his Bohemian woods. A national strain runs through nearly all his work. On his return he wrote Humoresques, of which No. 7 proved remarkably popular. His programme music contains the famous cycle of three overtures, Amid Nature, Carnival, and Othello, and several tone poems; but he reached his finest expression in symphonies (of which he wrote nine and published five), the cello concerto, and chamber music. Director of the Prague Conservatoire from 1901, he died May 1, 1904.

**Bibliography.** Studies in Modern Music, W. H. Hadow, series ii, 1895; Antonin Dvorak: His Achievement, ed. V. Fischl, 1943; Dvorak, A. Robertson, 1945.

**Dwarf.** An abnormally short human being, or small animal or plant. Among human beings, the Asiatic negrito and African negrito races, with a maximum stature of 4 ft. 11 ins., are usually called pygmies. The conventional maximum of spectacular dwarfism in the white and yellow races is 4 ft.

Notable court dwarfs were Queen Mary I's John Jervis, 24 ins., and Queen Henrietta Maria's Jeffery Hudson, 18 ins. at 30, and 45 ins. at death. Examples exhibited in London during the 19th century included the Polish count Boruwlaski, 39 ins.; the American, Charles Stratton (General Tom Thumb), 31 ins., who married Lavinia Warren, 32 ins.; the Fairy Queen, 16 ins.; the Mexican Midget, Lucia Zarate, and the French Princesses Topaze, each 20 ins. in height.

Dwarf races are primitive peoples whose average adult male stature is below 4 ft. 11 ins. There are two main groups: Asiatic negritos, comprising Aeta, Andamanese, Semang, Tapiro, and others; African negrillos, including Akka, Batwa, Bambute, and allied tribes.

The physiological basis of dwarfism is to be sought in the complicated inter-relationships of those endocrine organs which exercise a control over the processes of growth. Most important here are the pituitary and the thyroid. Hereditary or other peculiarities of these glands lead to marked disturbances of the normal development of the embryo. For instance the achondroplastic dwarf, popular as the court jester for so long, is simply a victim of a thyroid deficiency. Dwarf races are races in which an abnormal relationship between the endocrine glands and the rest of the body has become fixed. In different cases the oddness may be in the glands or in the rest of the body. In some animals—e.g. certain barnacles, insects, fishes—the males are relatively very small. The manner of evolution of these dwarf males has provided matter for discussion among zoologists.



Dwarf. Samson, a South American dwarf, standing on the table talking to his manager

The most satisfactory theory of pygmy origins regards these peoples as representing the early divergence from the main human stock of a tropical hunting type which has conserved its physical characters and primitive culture in racial isolation. This explains the absence of dwarf races from tropical America as well as from cold latitudes. The arctic Eskimo, the E. Siberians, and the European Lapps, together with the austral Yahgans of Tierra del Fuego, the Cape Bushmen, and the Ceylon Veddas, are short rather than dwarfish, being well above the pygmy stature, and alien to the pygmy culture. See Giant; Man; Negrito; Pygmy.

**Dwarka.** Municipality of India. It stands on the N.W. promontory of the Kathiawar peninsula. It contains the temple of Dwarkanath (Krishna), and is one of the holy places of India, the resort of Hindu pilgrims. Pop. 9,700, nearly all Hindus.

**Dwelling.** Habitation of mankind for repose, shelter, and domestic life. Dwellings may be natural or artificial, temporary or habitual, portable or fixed. That primeval man dwelt in tropical forest trees is a conjecture supported by anthropoid usage. Arboreal structures still characterise some primitive peoples, as among the Khas, Moïs, and in the Solomon islands. When he migrated to the limestone lands of temperate Eurasia palaeolithic man utilised the rock-shelter and the cave-dwelling. This type of habitation also survives.

The rudest effort of art upon the ground level is the wind-screen, sometimes primarily to protect the fire. Hence emerged the hut, formed by binding the tips of saplings, and often skin-covered in cold weather. Devised in the palaeolithic age, it still exists in primitive forms among the African pygmies, Bhils, Botocudos, Fuegians, and Veddas. The natural hollow, and its simulation by an artificial pit, gave rise to the beehive roof and the lean-to or pent-roof, resting on the ground. Their conical or gabled surfaces were covered with thatch, turf, earth, or skins; rudimentary forms are still known—Ainu, Chukchis, and the Eskimo snow-house (igloo).

Thus arose the two simplest of structural types, the round and the oblong. The former prevailed in neolithic and early-metallic Europe. The Swiss lake-dwellers plastered their timbered huts with clay; this wattle-and-daub construction—sometimes as a secondary derivative from the plain thatch—still

endures. The dome-shaped or conical hut, developed in local forms in aboriginal America, prevails over wide regions in negro Africa. It may have a bamboo palisade, a loose-stone wall, or a defensive stockade. When used by nomad peoples it became the round Kirghiz yurt or the American tipi.

The introduction of metal tools and carpentry replaced pit-digging by the erection of posts, walled with unhewn or hewn timber, matting, stone, or clay. Sun-dried bricks, developed early along the Nile and the Euphrates, still survive in Mexico and the Sudan. The pent became the elevated roof, whose construction displays much diverse ingenuity, from the Bantu thatch, which may be double, as in Uganda, to the interlaced palm-leaves of Polynesia and the elegant timber carving of Japan. The neolithic lake-dwellers introduced pile-foundations in shallow waters, a practice still extant in Borneo and New Guinea. This cultural advance found its full development in the hewn masonry of Egypt, whose influence, passing into the Aegean, affected the architectural achievements of the Graeco-Roman and the Indo-Aryan world, spreading thence across the Pacific to the ancient American civilizations.

The early-Aryan rectangular house led to the formation of streets, and in the eastern branch to the quadrangular enclosure, at first a cattle-pen, afterwards the courtyard characteristic of the civilized Orient. The roof-angle is determined by the problem of rain and snow, as in the steep Scandinavian gable. The flat roof characterises Semitic life in sunny lands. Many-storeyed dwellings are developed in every continent. House-partition for sex-segregation is traceable to a remote antiquity. With many primitive peoples the social organization involves separate dwellings for unmarried girls and unmarried men. Communal houses for family or tribal groups are exemplified by the long-houses of the Iroquois and the Melanesian peoples. See Bee Hive Structure; Cave, Cliff, and Lake Dwellings; Igloo; Kraal; Wigwam.

**Bibliography.** History of Mankind, F. Ratzel, Eng. trans. A. J. Butler, 1896-8; The Races of Man, J. Deniker, 1900; Handbook to the Ethnographical Collections in the British Museum, T. A. Joyce and O. M. Dalton, 1910.

**Dwight, JOHN** (fl. 1671-98). English potter. He is believed to have been born in Oxfordshire, and to have been a member of Christ Church, Oxford. In 1671 and 1684 patents were granted him by

Charles II for the manufacture of porcelain, the secret of which he claimed to have re-discovered; but he can only be credited with the invention of an improved process of stoneware. He employed Italian workmen at the Fulham pottery works which he founded; and, in addition to utilitarian stoneware, he produced many fine statuettes and busts, including those of James II and Prince Rupert.

**Dwight, TIMOTHY** (1752-1817). American Congregationalist and poet. Born at Northampton, Massachusetts,



May 14, 1752, and a grandson of Jonathan Edwards, he was educated at Yale College. An army chaplain during the Civil War after being a minister at Greenfield, Connecticut, 1782-1795, he was president of Yale from 1795 until his death at New Haven, Jan. 11, 1817. His *Theology Explained and Defended*, 1818, a course of 173 sermons, has passed through more than 100 editions. He wrote the patriotic song, *Columbia*, and an epic, *The Conquest of Canaan*, and was author of an *Essay on Light*.

First of the great American college presidents, the number of students at Yale almost trebling during his presidency, Timothy Dwight was an advocate of co-education and of the higher education of women.

His grandson, another Timothy (1828-1916), was professor of New Testament Greek and exegesis, Yale divinity school, 1858-86; president of Yale, which during his term of office assumed the status of a university, 1886-99; and a member of the American committee for the revision of the English Bible, 1872-85. He contributed to the *New Englander* a series of articles on *The True Ideal of an American University*, 1870-71; and was the author of *Memories of Yale Life and Men*, 1903.

**Dwyka Series.** Shales and conglomerates beneath the Ecca formation in the S. African Karroo system. They extend for 800 m. from the Transvaal through the Orange Free State prov. and Natal into the Cape prov., with a maximum thickness of 2,300 ft. The lower Dwyka shales, of Permo-carboniferous date, were overlaid by deposits in and around the vast Karroo lake, into which icebergs broken from the faces of glaciers



dropped huge striated boulders of granite, jasper, and other rocks. The resultant conglomerate resembles English boulder-clay, but so greatly hardened as to be quarried at Umgeni for road-metal. This conglomerate was overlaid by the fine-grained upper Dwyka shales, whose fossil reptiles and plants correlate them with the Indian Gondwana system. This series is named after the Dwyka river.

**Dyak** OR **DAYAK**. Popular name for the Indonesian non-Malay peoples in Borneo. The land Dyak embrace some settled agricultural tribes in the Klemantan group. They use 8 ft. blowguns, sumpitan, with envenomed darts, and



Dyak. Woman in native costume. Upper, man in gala dress

practise cremation. The round-headed proto-Malayan sea Dyak, preferably called Iban, are the most tattooed Bornean tribe and were the most inveterate head-hunters. See Borneo.

**Dyas** (Gr., the number two). Alternative name for the uppermost system of palaeozoic rocks, called by R. Murchison the Permian. It was introduced by J. Harcou, on the analogy of the Trias which lies above it, because it is represented in Germany by two well-marked stages, the red sandstone (Rothliegende) and the minestone (Zechstein). See Permian.

**Dyce, ALEXANDER** (1798-1869). British literary and dramatic editor. Born at Edinburgh, June 30, 1798, he was educated at its high school and Exeter College, Oxford, subsequently taking orders. From 1825 he devoted himself to editing the old dramatists. He brought out Peele, 1828; Web-

ster, 1830; Greene, 1831. In 1833 he completed Gifford's edition of Shirley, and edited Middleton in 1840, and Skelton in 1843. He brought out the Works of Beaumont and Fletcher in 11 vols., 1843-46; issued an edition of Marlowe in 1850; and in 1857 appeared his valuable edition of Shakespeare, which he was engaged in revising when he died, May 15, 1869.

**Dyce, WILLIAM** (1806-64). Scottish painter. He was born at Aberdeen, Sept. 19, 1806, and educated at Marischal College. In 1830 he settled at Edinburgh as a portrait-painter. In 1835 he was elected Associate of the Scottish Academy. Successful in the Westminster Hall competition, he produced a fresco, The Baptism of S. Ethelbert, the first to be completed in the houses of parliament, 1845; and in 1848 became R.A. He died at Streatham, Feb. 14, 1864. See Augustine illus.



William Dyce, Scottish painter

**Dyer, SIR EDWARD** (c. 1540-1607). English courtier and poet. Born at Sharpam Park, Somersset, he went to Oxford and after Continental travel was introduced at court in 1566. A close friend of the Sidneys, and a member of the literary coterie known as the Areopagus, he enjoyed a high reputation as a man of character and a poet. He was sent by Elizabeth on a diplomatic mission to the Low Countries in 1584, acted as one of the pall bearers at Sir Philip Sidney's funeral in 1586, went on a diplomatic mission to Denmark in 1589, and acted as commissioner for the attachment of forfeited lands. Knighted and made chancellor of the order of the Garter in 1596, he retired after the accession of James I. He died in 1607, and was buried in S. Saviour's, Southwark. He is remembered as author of the poem, My Mind to Me a Kingdom is, published (without author's name) in William Byrd's Medius: Psalms, Sonnets, and Songs of Sadness and Piety, 1588. His complete works were edited by A. B. Grosart, 1872.

**Dyer, JOHN** (1700-57). British poet. A Welshman by birth, after studying art for a short time he became a clergyman. His chief merit is in the appreciation of nature shown in his poems Grongar Hill and The Country Walk, both

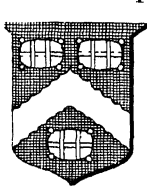


Dyers' Greenweed. Flowers and foliage of this dwarf shrub

published in Savage's Miscellany, 1726. The Ruins of Rome appeared in 1740. He died Dec. 15, 1757. His poems were edited by Edward Thomas, 1903.

**Dyer, REGINALD EDWARD HARRY** (1864-1927). British soldier. Born at Simla, Oct. 9, 1864, he was educated at Middleton College, co. Cork, and was commissioned in the Royal West Surrey Regiment in 1885. He transferred to the Indian army and became brigadier in 1916. In 1919 he was in command of the 45th infantry brigade sent to cope with disorders at Amritsar. On April 13 an unarmed mob of 5,000, demonstrating at the Jallianwallah Bagh, adopted such a threatening attitude that Dyer ordered his troops to fire, when 379 natives were killed and 1,200 injured. A committee of investigation severely censured Dyer, who was relieved of his command. The Army Council confirmed the committee's finding, and Dyer resigned from the army. One body of opinion, however, considered his action had prevented a serious rising. He died July 23, 1927. Consult The Story of General Dyer, I. Colvin, 1929.

**Dyers' Company**, THE London city livery company. Incorporated 1471, it was originally one of the 12 chief companies. With the



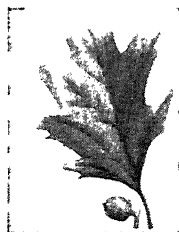
Dyers' Company arms

Vintners it has the right of keeping swans on the Thames, and it administers a number of charities. The hall in Dowgate Hill, E.C., erected 1840, is one of four, the first of which, on the site of Dyers' Hall Wharf, was burnt in 1666

**Dyers' Greenweed** OR WOAD-WAXEN (*Genista tinctoria*). Dwarf shrub of the family Leguminosae. A native of Europe, it extends into N. and W. Asia. The bright yellow flowers are small, and are succeeded by smooth, flat pods, an inch long, containing about five seeds. It yields a yellow dye, which was largely used by dyers in connexion with natural indigo and was known as Kendal green.

**Dyers' Oak** (*Quercus velutina*). Large tree of the family Fagaceae. A native of N. America, it is

known as quercitron and yellow-barked oak, the rough, brown bark being orange-coloured internally. It has variously divided large leaves and small hemispherical acorns. The bark is extensively



Dyers' Oak leaf and acorn

used in tanning and dyeing.

runs into thousands. Many older ones have been discarded. The earliest examples were easy to make, involving only a few processes, but current examples, though using the same basic materials—benzene, toluene, naphthalene, and anthracene (all products of coal-tar distillation)—tend to involve a long chain of processes which can be appreciated only by the trained organic chemist. The intermediate substances made as steps in the chain of processes between starting-point and dyestuff include picric acid and trinitrotoluene (well-known explosives); salicylic acid (from which aspirin and synthetic wintergreen oil are made); benzaldehyde (artificial almond flavouring); and toluene sulphonic acid (from which saccharin is made). Chemicals required to produce these intermediate substances include the poison gases chlorine and phosgene. This illustrates how the dyestuffs industry is inextricably bound up with the drugs, explosives, and similar industries, and becomes in time of war a matter of prime national importance.

#### Choosing the Correct Dyestuff

The popular idea—that to dye anything (say) blue, all that is wanted is some blue dye—is an over-simplification. No one dye will dye all textile fibres, and a dyestuff must be chosen which will dye the material to hand (cotton, wool, silk, acetate rayon, etc.). The dyer then has to consider what the textile is to be used for, and what conditions it will have to stand. The range of dyes available to give bright shades on a silk evening dress is entirely different from those suitable for curtains. Special requirements occur; dyes for bathing suits must be as little affected as possible by salt water and bright sunlight. Dyes are divided into ten main classes.

*Acid dyes* dye wool and silk from a dye bath containing acid; do not dye cotton or viscose rayon. Usually bright shades, not very fast to washing and only of medium fastness to light. There are several sub-classes.

*Basic dyes* dye wool and silk from a dye bath containing acid, but dye cotton only if it is mordanted with antimony salts and tannic acid. The basic dyes include the brightest shades known; they are of reasonable fastness to washing, but the poorest of all dyes in fastness to light. They tend to rub off easily.

## DYES AND DYESTUFFS

F. V. DAVIES, authority on Textiles

*This article classifies the various kinds of dyes and describes the materials of which they are made. See the articles on the various dyes mentioned and on materials that are dyed, e.g. Cotton*

Dyes are substances used to impart colour to textile fibres, leather, paper, etc., and to colour oils, varnishes, polishes, foodstuffs, and beverages. Not all coloured substances are dyes; fabric immersed in some highly coloured solutions is only slightly stained, and this stain may be washed out completely by water. Dyes are, however, absorbed by the fabric and strongly retained; thus, on immersing white wool in a dye bath containing a red "acid" dyestuff, the wool becomes red, and at the end of the process the liquor is almost or quite colourless. This property of substantivity, or affinity with the textile, distinguishes dyes from simple coloured substances.

Dyeing is an art of great antiquity, the aesthetic appeal of garments of many colours having been realized early in history; but until about 1860 the only materials available were natural dyes such as the juice of various berries and extracts from plants and woods. Perkin's discovery of synthetic mauve dye led to the formation of the synthetic or coal-tar dyestuffs industry. The initial important discoveries in this field were made by English chemists; but the disinclination of English industrialists to support them led to their adoption by Germany, and gave rise to the illusion that German chemists were far superior to the English. Before 1914, almost all synthetic dyes were German-made; but withdrawal of supplies during the First Great War forced the development of a British industry, and it came to be realized that a strong dyestuffs industry is closely bound up with strong general

chemical, drug, and explosives industries. Since 1914, the contributions of British chemists have been of prime importance; in particular the first green dye of the "guaranteed fadeless" type—Caledon Jade green—and the first dyestuffs which would dye acetate rayon were discoveries of British chemists.

Natural dyes are variable in quality and in shade produced, whereas synthetic dyes are sold standardised exactly for quality and shade. The desire to match a given shade exactly, at some later time, and the liking for subtle differences in shade, would remain unfulfilled in the absence of synthetic dyes. Most natural dyes as such have little affinity with textile fibres, which must be given a pre-treatment termed mordanting (Lat. *mordere*, to bite) before the colour can be "fixed" in them; whereas synthetic dyes, which require no mordanting, are available for all fibres. Among the few remaining natural dyes in use are cochineal on a tin mordant, used for army scarlet tunics; logwood extract to give the best and most lustrous blacks on silk; and natural indigo. In a class apart are the mineral dyes, which are really pigments actually formed on and in the fibres; commonest of these is "mineral khaki," consisting of iron and chrome oxides, used for khaki drill warehouse coats, shirts, shorts, etc.

#### Basic Materials

Apart from these few exceptions, the word "dyes" now signifies the synthetic, aniline, or coal-tar dyestuffs; and dyeing is the application of these to the fabric, etc. The number of these dyes

*Direct cotton dyes* dye cotton and viscose rayon without mordanting; most dye wool and silk also. For cotton the dye bath contains salt, and often a little soda ash; for silk and wool it contains acetic acid. These dyes are particularly useful in union fabrics and other materials containing more than one fibre, and are used for silk stockings with cotton feet and tops. They are of good fastness to washing; as regards light, they fall into two sub-classes, one of moderate and the other of high fastness.

*Chrome dyes.* These are really a special class of acid dyes, which dye wool, but require treatment of the textile with potassium dichromate before, during, or after dyeing, to bring out their superior properties in relation to light and washing. In some dyes the chrome is actually part of the dyestuff. The shades available are admirably suited for ladies' dress materials and men's suits. Their use is normally confined to wool.

*Sulphur dyes* dye cotton and viscose rayon from a dye bath containing sodium sulphide. Risk of damage by the sodium sulphide usually precludes their use on wool and silk. The shades are dull; and some colours (e.g. good reds) are lacking in the series. Fastness to light and washing is good or very good.

*Vat dyes* dye cotton, viscose rayon, wool, and silk, though great care is required in their use for wool and silk. Indigo is a natural vat dye, and both indigo and the synthetic vat dyes are peculiar in method of use. The dyes themselves are insoluble, but on treatment with sodium hydrosulphite are reduced to bodies soluble in caustic soda solution, which constitutes the dye bath. On subsequent exposure to air the insoluble vat dye is re-formed, firmly fixed in and on the fibres. The colour of the soluble leuco-compound is usually different from that of the parent vat dye. Vat dyes contain the fastest colours known; some tend to deepen in shade rather than fade in strong light, and they withstand long boiling in soap solution.

*Azotic colours.* These are mainly used on cotton, and are actually formed on the fabric by impregnating it with two intermediates in succession which combine to give the dye on and in the fibres. Generally they are of high washing and high light fastness, but tend to rub off easily.

*Acetate dyes.* Special dyes have been developed for cellulose acetate. They are usually fine dispersions of water-insoluble dyes, applied from soap solution. Some newer examples, however, are water-soluble. They have high light-fastness, and usually adequate fastness to washing.

*Solubilised vat dyes.* These are vat dyes chemically modified to be water-soluble. They are applied like acid dyes, and then given an after-treatment which re-forms the insoluble vat dye. They are thus more easily applied than vat dyes, and can be freely used on silk and wool; but they are expensive.

*Oxidised colours.* Aniline black, used for umbrella cloths, and fur dyes are typical examples of these. They are mixtures of salts of aniline and its related compounds, which are applied to the fabric and then treated with oxidising agents such as chromic acid. An insoluble dye is then formed on the fabric.

These dyes are commonly utilised as follows:

*Wool.* Acid dyes are usually used; where blends of different wools are involved, a sub-class of levelling colours is chosen. Where the highest fastness is wanted, as in suitings and overcoatings, chrome dyes are used. Best quality navy blues are vat-dyed; few so-called "indigo-dyed" goods are all indigo dye, the indigo being reinforced by synthetic vat blues or blacks, plus a final topping with an acid or basic colour.

*Cotton.* For most purposes, the direct cotton colours are chosen. Where good light-fastness in dull shades is required, the sulphur colours are used. For curtains and upholstery fabrics of the "guaranteed fadeless" type, vat dyes are used.

*Viscose rayon* is dyed like cotton.

*Silk.* Either acid or direct dyes give good results for normal purposes; for very bright shades on evening dress materials and lingerie fabrics, basic dyes are used. Vat dyes can be used for highest light-fastness (e.g. embroidery silks, Macclesfield silks).

*Acetate rayon* is treated with the special dyes developed for it.

*Nylon.* Some acid and direct colours are satisfactory, but the best results so far are obtained with acetate dyes.

*Linens* are dyed with direct, sulphur, or vat dyes, like cotton.

*Furs* are dyed with fur bases of the oxidised colours group.

*Paper* is dyed with direct dyes, unless made coloured by adding pigment to the pulp in the beater.

*Oils, varnishes, etc.* These are coloured with special dyes, soluble in methylated spirit or oil.

*Leather* is dyed with acid of basic colours.

*Foods and beverages* are coloured with selected dyes of special purity, which are free from any harmful effect. The colours to be used are regulated by law.

The methods of dyeing textiles fall into two main groups: in the yarn and in the piece, i.e., before and after weaving. The former is more expensive and is used only where yarn is sold as such (e.g. knitting wools) or where it is to be woven into a patterned fabric. Hanks of yarn are hung over poles, and are turned as they dip into vats of dye liquor; or hanks are packed into a machine which circulates dye liquor through them. A more recent method is to wind yarn into large bobbins or cakes with a central perforated core, and then to force dye liquor through them under pressure.

#### Dyeing in the Piece

Dyeing in the piece is done on the winch or in the jig. In winch-dyeing the cloth is stitched end-to-end to form an endless belt, most of it immersed in the dye bath, but part emerging and passing over a rotating frame, which keeps the fabric moving in and out of the bath constantly. This is normally done in rope-form (i.e. fabric bunched together sideways), but for delicate fabrics is done open width. In jig-dyeing, the cloth is made to take a long path through a comparatively small dye bath, by passing it over a number of rollers, in open width. Jig-dyeing is the basis of dyeing processes where fabric is fed in continuously at one end, and emerges dyed at the other end of the machine. Another method is padding; a small trough of dye is combined with squeezing rollers, rather like a domestic mangle, which pad the dye on to the fabric. Hosiery is placed in bundles in cotton bags, which are put in a perforated drum and this rotates in an outer drum containing the dye liquor.

Any form of dyeing is a highly skilled art; there is not only correct choice of dyes to consider, but also correct preparation of the textile by scouring and removing sizing; choice of machine; composition and temperature of dye bath; avoidance of patchiness and crease marks; and matching.

The inherent difficulties of the work of dyers and cleaners are added to by the "raw material" being usually a garment already dyed. A complication is that parts of worn garments most exposed to light and weather (e.g. coat lapels) absorb dye more rapidly than protected parts. Lastly, whereas the yarn or piece dyer knows what material he is handling, the garment dyer must find out, and may meet unusual combinations of fibres.

**Bibliography.** The Colour Index, ed. A. M. Rowe, 1924, with supplement, 1928; The Synthetic Dyestuffs and Intermediate Products, J. C. Cain and J. F. Thorpe, 1933; Dyeing with Coal-Tar Dyestuffs, C. M. Whittaker, 1939.

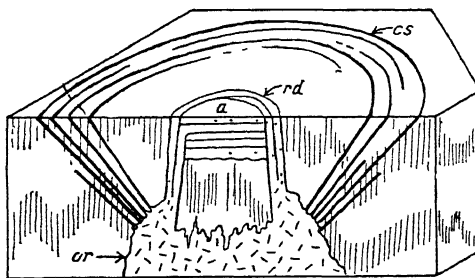
**Dyke** or **DIKE**. Defensive earthwork or its adjacent ditch, especially in early Britain. Dykes may be promontory forts, or protective works as used in Holland, and in Great Britain as fenland causeways. Some were made or re-used for national or tribal boundaries. Red Earl's Ditch, along the Malvern Hills, was feudal. The greatest, Wansdyke, 80 m. long, from the Severn to Inkpen Beacon, Berks, was pre-Roman. Black Dyke, from Richmond, Yorks, across the Roman Wall to Peel Fell, Northumberland, continues as the Catrail for 48 m. to Gala-shiels, Selkirkshire. Roman Dyke, Rushmore, Wilts, was Romano-British. There are 25 in Dorset, and perhaps 50 elsewhere, some being of Commonwealth date. (See Devil's Dyke; Grim's Dyke.)

In geology, dykes are wall-like masses of rock formed in vertical or highly inclined fissures in older formations. The name arose from their resemblance, when the softer enveloping rocks have been weathered away, to the structures made by man: in W. Scotland they are actually utilised as enclosures. Where the material forming the dyke is more easily eroded than the rock which has

been intruded, a narrow trench-like feature may be formed. In steep cliffs this would show as a chimney or a gully.

The rocks forming dykes show a wide range in chemical composition, but dolerites and basalts are the most common. Groups of dykes of similar age and forming a regular pattern are spoken of as a dyke-swarm. This may be radial around some volcanic centre, or parallel, the dykes all trending in one direction. Thus in W. Scotland, dykes of Devonian age at Glencoe trend N.E.-S.W., but those of Tertiary age associated with the volcanic centre of Mull run S.E.-N.W. Dykes vary in thickness from less than an inch to hundreds of feet. The Great Dyke of Rhodesia is some 300 m. long and 2-7½ m. wide. In Iceland a series of volcanic eruptions with extrusion of lava occurred in 1783 along the line of a new dyke—the Laki Fissure—about 20 m. long.

Ring-dykes, having a roughly circular plan at the earth's surface, are caused by the sinking of a



**Dyke.** Diagram showing association of ring-dykes (rd) and cone-sheets (cs) in a volcanic complex. The lavas (a) of the caldera lie on a sunken block of older rock (or) which has been let down into the magma reservoir

cylindrical mass of rock in the earth's crust and the injection of molten rock up the fracture so formed. They are probably formed at the same time as calderas (*q.v.*).

Sedimentary or Neptunian dykes have been formed in all geological ages, such as the pre-Cambrian sandstone dykes at Ben Slioch, Ross-shire, and those of limestone near San Francisco. These are sometimes the result of the filling-up of fissures by submarine earthquakes.

**Dykes, JAMES OSWALD** (1835-1912). British theologian. Born at Port Glasgow, Aug. 14, 1835, and educated at Dumfries academy, Edinburgh university, Heidelberg, and Erlangen, he was ordained at East Kilbride, 1859. Colleague of Dr. Candlish (*q.v.*), at Free S. George's, Edinburgh, 1861-64, he resigned through ill-health.

After spending three years in Melbourne, Australia, he was minister of Regent Square Presbyterian Church, London, 1869-88; and principal, 1888-1907, of the English Presbyterian College, Queen Square, London, afterwards removed to Cambridge, and known as Westminster College. His works include *The Beatitudes of the Kingdom*, 1872; *The Gospel According to S. Paul: studies in the first 8 chapters of his Epistle to the Romans*, 1888; and *The Divine Worker in Creation and Providence*, 1909. Dykes died Jan. 1, 1912.

**Dykes, JOHN BACCHUS** (1823-76). British musician and churchman. Born at Hull, March 10, 1823, he studied music at Cambridge and became a clergyman. In 1849 he was appointed pre-

center of Durham cathedral and vicar of S. Oswald's, Durham. He was one of the editors of *Hymns Ancient and Modern*, and composed a large amount of church music, including many hymn tunes. His tunes for *Nearer my God to Thee*, and *Jesu, Lover of my Soul*, attained immense popu-

larity. He died Jan. 22, 1876.

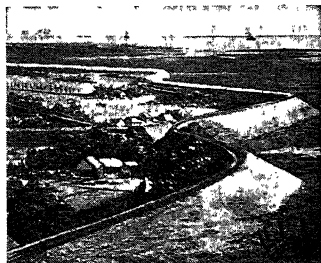
**Dykh-Tau.** Peak of the Caucasus, about 17,000 ft., Kabardin autonomous province, U.S.S.R.

**Dyle.** River of Belgium. Mainly in Brabant province, it rises near Nivelles and flows generally N. to Louvain, N.W. to Malines, and joins with other tributaries that fall into the Schelde. The Dyle line was a position occupied by the B.E.F. in Belgium in 1940. On May 10 the B.E.F. crossed the Belgian frontier and advanced to positions on the Dyle extending from Wavre to beyond Louvain. The Germans advancing from Maastricht were held on this line until May 16, when the B.E.F. withdrew to conform with the movements of the French 1st army on their right flank.

**Dymchurch.** Seaside village of Kent, England, 7½ m. S.W. of



**James Oswald Dykes,**  
British theologian  
Moffat



**Dyke.** "Watcher" dyke, outermost in the system of three dykes, watcher, dreamer, and sleeper, which guard the reclaimed soil of Holland from the sea

Folkestone. Situated on the borders of Romney Marsh, it is connected with Hythe and New Romney by a 15-in. gauge rly. Noted for its fine stretches of sand, diminutive church, and ancient inn, the village is described in Kipling's *Puck of Pook's Hill*, and in the works of H. G. Wells, who laid an early scene of *The War in the Air* on Dymchurch beach.

**Dymoke.** English family in which the ancient office of king's champion is hereditary. The origin of the Dymokes is variously traced to the village of Dymoke, in Gloucestershire, and to a place of that name on the Welsh border. Sir John Dymoke (d. 1381) was champion at the coronation of Richard II, the earliest recorded performance of the ceremony, and based his right on his ownership by grand serjeanty of the manor of Scrivelsby, in Lincolnshire. Henry Dymoke (d. 1865) was champion at George IV's coronation, after which the ceremony was discontinued, though the office remained. In the reigns of George V and George VI, the champion was Frank Scaman Dymoke (1862-1946). See *Champion*.

**Dynamical Equivalent of Heat.** Whenever work is converted into heat, or vice versa, there is an unchanging relation between the work done and the heat produced or lost. The quantity of work exerted to produce the unit quantity of heat energy is called the dynamical equivalent of heat. The first to determine this equivalent was Joule, whose first method consisted in measuring the heat developed when a known amount of work was done in stirring water. It has been found that the energy converted into sufficient heat to raise the temperature of one gramme of water one degree Centigrade (from 14.5° to 15.5°) is 4.185 times 10<sup>7</sup> ergs, where the erg is the c.g.s. unit of work. See *Heat*; *Thermodynamics*.

**Dynamics** (Gr. *dynamis*, power). Branch of the science of mechanics which investigates the action of force. It therefore includes the investigation of the conditions of bodies which are in a state of equilibrium owing to the forces acting upon them, although this special branch of the science is often referred to as "statics." The investigations depend ultimately on the Newtonian Laws of Motion. The various departments embrace the dynamics and statics of a particle which is acted upon by forces in one plane or in more than one plane; the plane



Dymchurch, Kent. The church in this seaside resort on the borders of Romney Marsh

dynamics of a rigid body; the three dimensional statics or dynamics of a rigid body, with which is associated the theory of screws; and by extension of the meaning of the term dynamics, those problems of analytical dynamics which investigate the action of forces on systems of particles, or the "problem of three bodies," which refers to the mutual attractions of three bodies in space, e.g. the Earth, Sun, and Jupiter, a problem which can be solved only in special cases. See *Motion*.

**Dynamite.** Name applied to a variety of high explosives of which the essential feature is a high content of nitroglycerine, absorbed in an active or inert porous base. Dynamite was invented by Nobel in 1866, when, owing to very many disastrous explosions, nitroglycerine was prohibited in various countries. He found that it could be rendered comparatively safe by absorption in kieselguhr (*q.v.*), which can retain up to three times its weight of nitroglycerine. This mixture, known as No. 1 or kieselguhr dynamite, is still the best known dynamite with an inert base. About 1 p.c. of magnesium carbonate or chalk is usually added to neutralise the acid evolved by nitroglycerine on storage.

The calcined kieselguhr is weighed out into a rubber bag, after it has been thoroughly mixed with the carbonate and sieved, the nitroglycerine being added in small portions, while the mass is kneaded by hand to form a paste, the operation lasting about 30 minutes. The dynamite is formed into cartridges by pressing it into parchment paper tubes by a wooden plunger working through a funnel. All these operations are dangerous and only small quantities of explosive are dealt with in light buildings protected by mounds.

In modern blasting explosives kieselguhr has been largely displaced as the absorbent by "active" and explosive bases, generally consisting of a mixture

of wood meal, flour, or similar carbohydrate and sodium or potassium nitrate. Nitro-cellulose is widely used as an explosive base, and many dynamites in British mining contain high percentages of ammonium nitrate.

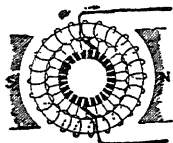
Dynamite is a powerful high explosive of considerable brisance, while its plasticity is a great advantage in filling boreholes and applying it to solid objects for demolition purposes. It is safe to handle and transport, but is too sensitive to shock for employment in shell, and since it is detonated by the impact of a rifle bullet it is not a safe military store. If ignited in small quantities it burns fiercely but does not explode. Black powder will cause it to explode, but complete detonation can be effected only by initiation with a detonator.

Dynamite has two marked disadvantages: exposure to moisture displaces the nitroglycerine, causing exudation and dangerous sensitivity; it freezes about 10° C., when, whilst it is more insensitive to detonation, causing misfires, it is more sensitive to shock and friction. Frozen dynamite must be carefully thawed in a special oven. Exudation is guarded against by the use of special wrappers, and freezing can be prevented by using nitroglycerine containing substances which lower its freezing point and storing the dynamite in heated magazines. Dynamite is chiefly used for blasting operations where a powerful shattering effect is required. See *Blasting Gelatine*; *Explosives*; *Gelignite*.

**Dynamo.** Machine for converting mechanical energy into electrical energy, frequently (but incorrectly) known as a generator of electricity. The principles underlying the induction of electromotive force in a conductor cutting a magnetic field, and the elements of commutation to produce a unidirectional or direct current, are discussed under *Electro-magnetic Machine*. The evolution of the present-day machine of 1,500 kW or more has necessitated many changes from the single rotating coil and two-part commutator.

**ARMATURE DEVELOPMENTS.** The first step in evolution was to increase the number of coils and commutator segments to give a more sustained effect than the single coil, and an early method is shown in Fig. 1, which indicates the Gramme ring method of winding the armature, as the rotating

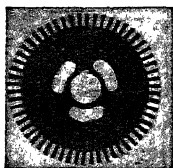
system of a dynamo is called. In this system, a number of coils are wound round an iron ring, as shown, the connexions between adjacent coils being attached to the commutator segments. This type had several advantages. As one side of each coil was inside the iron ring, it was shielded from the



Dynamo. Fig. 1. Ring winding on an armature, shown diagrammatically. N and S are the north and south poles of the magnet

magnetic field and consequently was inactive. This resulted in a waste of copper and space; also it was difficult to arrange an efficient mechanical connexion between the shaft and the ring, for driving purposes.

The ring armature has now been superseded by the drum type, in which the coils are laid in longitudinal slots on the surface of an iron drum, both coil-sides contributing to the output of the machine. If the drum were of solid iron it would act as a conductor cutting flux, and eddy currents would flow in it, causing it to get very hot and increasing the magnetic drag, thus reducing the efficiency of the machine. It is therefore laminated, or built up from a number of thin stampings of soft iron or alloy steel, insulated from each other by a coat of varnish. A typical stamping is shown in Fig. 2, with the slots arranged round the circumference. The hole in the centre has a keyway for the driving shaft; the other



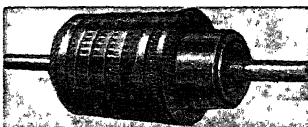
Dynamo. Fig. 2. Armature stamping showing longitudinal slots in which the conductors of an armature are embedded

holes are ventilating ducts for cooling. Large machines have a hollow drum, built up from stampings, secured to a hub with solid spokes, known as a spider, to economise in the stamping alloy.

The coils are wound so that each slot contains one side of each of two coils. In small machines, a mush winding is frequently used; the conductor is wound directly into the slots, usually by hand, without any particular attempt at symmetrical arrangement of the coil-ends. Larger machines are former-wound, i.e. the coils are

wound to shape on specially designed formers, taped up solid, and shaped so that when dropped into the slots the end connexions are smoothly and symmetrically arranged. Whichever system is used the slots are lined with thick insulating paper or board, to prevent chafing of the coil insulation, and the coils are secured in the slots and prevented from flying out by fibre wedges and by bands of steel piano wire wound round the circumference of the armature, the ends being securely soldered.

The commutator of a modern machine is built up of a number of

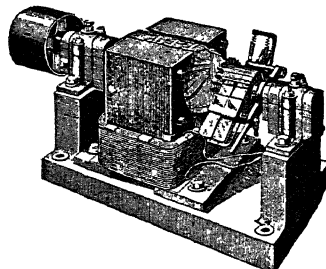


Dynamo. Fig. 3. Drum armature and commutator

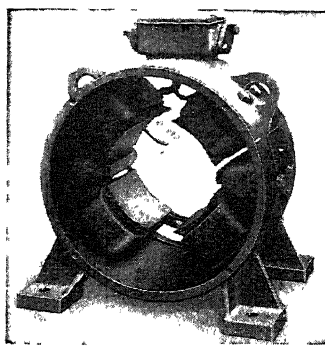
shaped copper segments, insulated from each other by mica, and secured by clamping between mica covered rings. Fig. 3 shows a typical armature with commutator.

The actual method of connexion between the coils and the commutator depends on the size and output of the machine. For small high voltage machines, the wave winding is used, so called because if successive coils are traced out they follow a wave-like or zig-zag path around the armature. Larger machines are usually lap-wound; the coils form a series of closed loops, each overlapping the next one.

**FIELD MAGNET.** It was found that a much more powerful field could be produced by an electro-magnet than by the permanent magnets

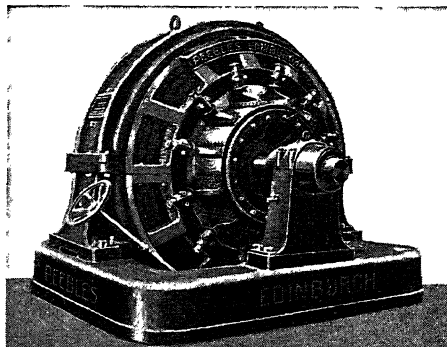


Dynamo. Fig. 4. Early overtype dynamo with 2-pole horse-shoe shaped field magnet



Dynamo. Fig. 5. Field system of dynamo, showing 4 poles and interpoles

used in the earliest machines. The horse-shoe shape of the magnet, with two poles, persisted for many years; an early type of dynamo is shown in Fig. 4. This type has now been completely superseded by the circular pattern, on account of its reduced magnetic leakage, as well as the way in which it permits a neater and more compact type of machine. In this type, two, four, or more poles are arranged, alternately north and south, within a circular



Dynamo. Fig. 6. Open type dynamo of 1,000 kW capacity

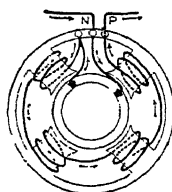
yoke, as seen in Fig. 5, which shows a four-pole machine, with two interpoles, or commutating poles, whose function is to assist commutation, and prevent sparking at the brushes.

The original method of excitation of the electro-magnet was from a battery, but it was later found possible to make the machine supply its own field. Sufficient residual magnetism usually remains in the iron of the magnet to produce a weak voltage when the machine is rotated, giving a small current in the field circuit which strengthens the generated voltage, this action continuing until the



machine has built up to its normal running conditions. Early machines were often slow and unreliable in building up, and it was common practice to employ a separate exciter machine to supply the field of a larger machine or group. Separate exciters are still used for alternators which, generating alternating current, are unable to supply their own field systems; but modern dynamos (Fig. 6), unless intended for special duties, are usually self-exciting.

In a series winding (Fig. 7) the field coil consists of a few turns of thick wire, carrying the whole of the current given by the machine. This system is seldom used for dynamos, which are more often shunt-wound; several turns of fine wire being connected directly across the brushes and a small current shunted off from the main circuit (Fig. 8).



Dynamo. Fig. 7.  
Series winding

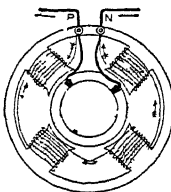


Fig. 8.  
Shunt winding

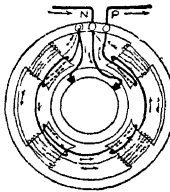


Fig. 9.  
Compound winding

When load is taken from a dynamo its voltage will drop by an amount depending upon the design of the machine. To compensate for this, compound winding is often used (Fig. 9). In this a shunt-wound machine has a few series turns added to the coils. As the machine is loaded, the current in the series turns assists the shunt coils, thus keeping the machine voltage more constant. By over-compounding, i.e. putting a larger number of series turns on, the machine voltage can actually be made to rise as the load comes on, thus compensating for the voltage drop along feeder cables and maintaining a constant voltage at a distant point. The interpoles previously referred to are excited by series turns, but play no part in the regulation of the machine voltage, their function being solely to improve commutation.

**BRUSHES.** The bundle of copper wires or gauze, originally used for collecting current from the commutator, exists now only in name. Modern brushes are nearly always of carbon, and are pressed against the commutator by springs, and held in brush holders or boxes, which are themselves secured to a

brush rocker attached to the machine frame. This device was so called because, before the advent of interpoles, it was necessary to rock the brushes backwards or forwards with every change in load, to prevent sparking.

E. B. Watton

**Dynamo-Metamorphism** (Gr. *dynamis*, power; *meta*, implying change; *morphe*, form). Term for alteration of rock-structure by lateral pressures due to movements in the earth's crust; introduced by A. Harker to denote the effects of high pressure and low temperature, thermo-metamorphism being used to denote the effects of low pressure and high temperature.

The changes produced are physical and mineralogical, and usually render rocks more highly crystalline. Homogeneous rocks under pressure develop cleavage-planes, foliation, and schistose structure.

Thus clays, shales, or fine-grained volcanic dust may become roofing-slates, coarse-grained rocks may become gneisses. Heterogeneous rocks, if brittle and

yielding strata are intermingled, develop folding and faulting. Mineralogical changes include recrystallisation and the formation of chlorite and mica. See *Geology*; *Metamorphism*.

**Dynamometer** (Gr. *dynamis*, power; *metron*, a measure). Device for measuring force or power. Though the term dynamometer has been extensively used for many different kinds of measuring instruments, it is more commonly applied to instruments used for measuring the h.p. of engines. They may be divided into three classes: (1) those for measuring the pull of anything; (2) those for measuring the push or thrust; and (3) those for measuring twisting power or torsion.

The first type measures such forces as those exerted by railway locomotives, traction engines, etc., and consists essentially of a powerful spring balance through which the power is applied. The second type measures such forces as the thrust of an aeroplane propeller or steamship screw, and the third the force exerted by a revolving shaft. Both types may consist of recording springs or brake attachments.

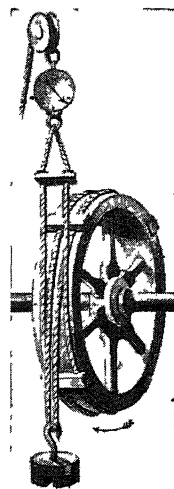
When a brake is used it absorbs power and the dynamometer is called an absorption dynamometer. Transmission dynamometers measure the horse-power of machines without any absorption of power, save that due to friction, and the majority consist of recording spring devices.

The illustration shows a common type of brake dynamometer. To one end of a rope, encircling the flywheel of the engine, is attached a weight, and the other end is fastened to a spring. The motion of the wheel tends to lift the weight, and this tendency is measured on the spring and from it, and the known revolutions per minute of the flywheel, the horse-power being exerted can readily be calculated.

In the Froude hydraulic dynamometer the rotating element exerts a turning moment on the fixed element through a liquid medium, usually water, which flows through the apparatus and carries away the heat generated by the absorption of energy. This type of brake can therefore be used to measure larger outputs than the type shown in the illustration. Electrical dynamometers depend on the absorption of energy by eddy currents.

**Dynamotor.** Device, frequently known as a rotary transformer, which combines in one machine the functions of a motor and a dynamo, and enables direct current to be transformed from one voltage to another. It has one field magnet system and two armatures, or more usually one armature with two separate windings and commutators. Small sizes are widely used in radio work, to provide a high tension supply for portable transmitters, etc., where H.T. batteries would be inconvenient or impracticable.

The term is also (not strictly correctly) applied to automobile work where one machine functions as both charging dynamo and starting motor. In this device, the armature has one winding, and



Dynamometer. Common type of brake dynamometer

the field magnet system two; a shunt winding for normal running as a dynamo, and a series winding for engine starting.

**Dynasts**, THE. Epic-drama by Thomas Hardy. This masterpiece, described as the greatest single achievement of Hardy's career, consists of three parts, 19 acts, 130 scenes. Hardy's original intention was to write a chronicle play to celebrate Great Britain's part in the Napoleonic wars from 1805 (Trafalgar) to 1815 (Waterloo). But its huge canvas, monumental structure, hundreds of characters, and above all the superhuman comments of "phantom intelligences"—like the Spirits of the Years, of the Pities, etc., who form a kind of Greek chorus—enlarge the drama into a vision of the destiny of man. Blank verse, rhyme, and prose are all employed. The three parts were published separately in 1903, 1906, and 1908. An adaptation by H. Granville-Barker was staged at the Kingsway Theatre, London, in 1914, and at Oxford in 1920.

**Dyne** (Gr. *dynamis*, power). Unit of force, defined as the force necessary to be applied to a mass of one gramme to produce an acceleration of one centimetre per second every second. This force is very nearly equal to the force with which the earth attracts a weight of one milligramme. See *Erg*.

**Dynobel**, POLAR. British permitted explosive used for cutting hard coal and for moderate ripping, and as a general purpose explosive in the pit. Typical compositions of the dynobels are 14–16 p.c. nitroglycerine and 0.5–1.5 p.c. nitrotoluenes, gelatinised with 0.25–0.75 p.c. nitro-cotton, 51–54 p.c. ammonium nitrate, 24–26 p.c. sodium chloride, 4–6 p.c. wood meal, and 0–2 p.c. moisture.

**Dysart**. This locality in Fife, Scotland, forms part of the burgh of Kirkcaldy (*q.v.*).

**Dysentery** (Gr. *dys*, implying badness; *entera*, intestines). Term popularly applied to any condition of the bowel associated with diarrhoea and abdominal pain. Bacillary dysentery, the more severe form of the disease, is an acute colitis characterised by fever with frequent painful stools containing blood, pus, and mucus. No country is exempt but cases in the tropics are always more serious than those which occur in temperate climates. The bacillus of Shiga, the Flexner group, the bacillus of Sonne, are the main organisms among those which cause the condition. They are

ingested with food or drink which has been contaminated by faecal matter conveyed by flies or unclean hands. The incubation period is about a week and the onset is sudden with fever, headache, vomiting, and severe diarrhoea.

The bacilli of dysentery do not penetrate deeply into the mucous membrane of the bowel, and perforation and stricture are not of the syndrome. Treatment should be initiated by washing the germs away with small concentrated two-hourly doses of Epsom salt followed by one of the sulphate drugs. Dysenteric serum is of value early in the disease. The management of the case implies rest, warmth, a low residue diet, and the combating of shock, with the replacement of lost fluid. Death may occur from toxæmia or dehydration. The disease often becomes chronic, flaring up from time to time. Summer diarrhoea in children is often really bacillary dysentery.

Amoebic dysentery results from infection of the colon by *Entamoeba histolytica*, and is characterised by large stools containing mucus and dark red blood. Fever is seldom present. It is much less serious than bacillary dysentery, occurring mainly in the tropics. The cystic form, the amoeba, is swallowed with contaminated food or drink, and after passing through the stomach the cyst wall is dissolved by the pancreatic juice, and the freed organism nests in the glands of the large intestine. As a result of its activities small abscesses form, resulting in superficial ulcers which are the source of the blood and mucus passed. Adhesions and perforation with resultant peritonitis may be caused by these ulcers, and the amoeba travelling afield may set up abscesses in lung or liver. The incubation period varies from 3 weeks to 3 months and the onset of the characteristic diarrhoea is insidious. Most cases run a chronic course, tending to improve even as they tend to relapse. Emetine is the essential cure, with carbarsone, one of the arsenical group, and yatrien as adjuvant substances. Perforation of the bowel demands immediate surgical intervention to save life, and lung or liver abscesses more leisurely surgical consideration.

As both forms of dysentery are caused by the soiling of food and drink by organisms present in faeces and conveyed by flies and hands, the prevention of the disease lies in cleanliness and in the exclusion of flies from food

substances. As many patients become carriers, it is now general in hospitals and hotels to examine medically and with the aid of the laboratory the chef and kitchen staff, to make sure that the disease is not latent in them.

Hilary Ledgerwood, M.B.

**Dysidrosis** (Gr. *dys*, implying badness; *hidrōs*, sweat), POMPHOLYX (Gr. bubble, vesicle), or CHEIRO-POMPHOLYX. Acute eruption of vesicles produced by an inflammatory exudate on the skin of the hands and feet, associated often with excessive sweating. It sometimes follows local irritation, as in doctors and nurses after the use of antiseptic solutions, or in war workers handling exploded aeroplane bombs. Burning and extreme itching are the most marked symptoms. The condition is worse in spring and summer and often tends to recur at the same period of the year. Scratching may lead to secondary infection.

**Dyson**, SIR FRANK WATSON (1863–1939). British astronomer. Son of a Baptist minister, he was



Sir Frank Dyson,  
British astronomer  
Russell

born at Ashby, Jan. 8, 1868, and went to Bradford grammar school and Trinity College, Cambridge. He entered the Royal Observatory, Greenwich, as chief assistant in 1904. In 1906 he was made astronomer royal for Scotland and in 1910 transferred to the corresponding position in England. He became F.R.S. in 1901, was knighted 1915, retired 1933, and died on a voyage from Australia, May 25, 1939. Dyson started extensive programmes for measuring the positions, distances, motions, brightnesses, and colours of stars in the Greenwich astrographic zone. He greatly improved the time service from Greenwich; and the expeditions he sent out to observe total solar eclipses in 1919 helped to verify Einstein's theory of relativity. He wrote *Eclipses of the Sun and Moon* (with R. Woolley), 1937.

**Dyson**, SIR GEORGE (b. 1883). British composer. Born at Halifax, May 28, 1883, he was educated at the Royal College of Music, and after travelling in Italy and Germany was music master at Osborne, 1908; Marlborough, 1911; Wellington, 1921;



Sir George Dyson,  
British musician

Winchester, 1924-37. He was then appointed director of the Royal College of Music. In musical education he exercised a strong influence, and published *The New Music*, 1924, an examination of modern technique in composition. His compositions included songs, piano pieces, and church music, e.g. *In Honour of the City*, 1928; *The Canterbury Pilgrims*, 1931; *The Blacksmiths*, 1934; *Quo Vadis*, 1939. A symphony was published in 1937, and a violin concerto in 1942. Dyson also wrote a *Manual of Grenade Fighting* during the First Great War which was officially adopted by the War office. Northcliffe lecturer in English literature at London university, 1940, he was knighted 1941.

**Dyson, WILLIAM HENRY** (1883-1938). British cartoonist. Born at Ballarat and educated at Melbourne, Will Dyson first attracted attention with his cartoons for the *Daily Herald*. A pictorial satirist of unusual imaginative and dramatic power, he championed not only the rights of labour but also the largest issues of political freedom. The most famous of his cartoons appeared in the *First Great War*. Interested in the social credit theory of C. H. Douglas (*q.v.*), he wrote *An Artist Among the Bankers*. He died Jan. 21, 1938.



Will Dyson,  
British cartoonist

**Dyspepsia** (Gr. *dys*, implying badness; *pesslein*, *peptein*, to cook, digest) or INDIGESTION. Acute dyspepsia is most often due to errors in diet, such as eating too much or unsuitable types of food. Alcoholic excess is a cause, and acute dyspepsia is sometimes an early symptom of many infectious fevers. The condition is characterised by pain in the stomach, nausea, vomiting, and belching of wind. The tongue is probably furred and diarrhoea or constipation reflects in the lower bowel the distress of the upper portion. Treatment is to withhold food for 24 hours and subsequently give light diet, while some form

of bismuth soothes the irritated mucous membrane. In adults, if the diagnosis is clear, a dose of calomel, followed next morning by a saline purge, is good treatment, but because of the treacherous nature and varying manifestations of appendicitis in children, a purge should never be given to them to relieve indigestion.

Chronic dyspepsia may follow the long continued intake of unsuitable or badly masticated food or excess of alcohol. It may be a symptom of Bright's disease, tuberculosis, or anaemia; it may be the first sign of cancer of the stomach. It may be caused by too great a secretion of gastric juice, or by a deficient secretion. This imbalance of secretion is often the protest of an outraged liver. The symptoms of chronic dyspepsia resemble those of the acute form. The underlying cause must be treated, and rest and regularly spaced meals are advisable. Alkalines and drugs of the belladonna family modify and inhibit over-free secretion, and the digestive ferments, such as pepsin and diastase, may be taken where secretion is deficient.

**Dysphagia** (Gr. *dys*, implying badness; *phagein*, to eat). Difficulty in swallowing; early sign of disease of the oesophagus, that part of the intestine connecting mouth and stomach. The discomfort is generally accurately localised by the patient. If the difficulty is at the upper extremity of the tube, the act of swallowing cannot be easily initiated; the underlying cause may be a severe anaemia common in women, hysteria, paralysis after diphtheria, or a more serious neuro-muscular non-coordination associated with the paralysis of organic lesion.

Distress in swallowing in the middle of the tube is almost always caused by malignant disease, though here also occur strictures resulting from injury or the cicatrization of old ulcerated surfaces.




Difficulty at the lower end of the oesophagus is most frequently associated with the condition mis-called cardiospasm, which is now recognized to be not so much a spasm of the contractile muscle of the part as a failure to relax by the sphincter opening into the stomach. This type is associated with degenerative changes induced by toxins or absence of vitamins in the mucous membrane of the tissues. Ulcers or malignant tumours are more serious reasons for cardiospasm, the diagnosis being decided by X-ray examination.

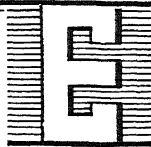
The type resulting from anaemia responds well to massive doses of iron; tumours may be susceptible to surgical or ray treatment; and contracting scars, or the so-called cardiospasm, will probably yield before the periodical passing of a weighted bougie. The non-malignant types cause loss of weight through vomiting or the inability to ingest sufficient food, but though the patient is thin a balance is eventually struck between intake of food and output of energy, and life is not directly endangered.

**Dysprosium**. Chemical element, a rare earth of the erbium family or sub-group of the yttrium elements, which are readily soluble in a saturated solution of potassium sulphate. Dysprosium, which has a close-packed hexagonal structure, was first isolated from the mother liquids after the separation of cerium by the alkali sulphate process by L. de Boisbaudran. The atomic weight is uncertain, but the international table for 1921 gives 162.5. The atomic number is 66. Dysprosium forms an oxide,  $Dy_2O_3$ , dysprosia, which is white and dissolves in acids giving green or yellow salts. Other compounds which have been prepared are the chloride, oxychloride, bromide, sulphate, carbonate, nitrate, and phosphate.

**Dystrophy** (Gr. *dys*, implying badness; *trophē*, nourishment) or MYOPATHY. Condition of groups of voluntary muscles in which the muscle undergoes primary degeneration resulting in loss of power, the rest of the body being healthy. The condition is of the muscle itself, no nerve lesion being found. The essential cause is unknown. There are various types of dystrophy named according to the age of onset and the groups of muscles affected. The disease is hereditary and is transmitted through the female. At some stage of life difficulty in walking, sitting up, or undertaking some common activity hitherto perfectly performed, calls attention to the presence of the condition. Treatment by massage and exercises is unsuccessful. Drugs are useless.

**Dytiscus** (Gr. *dytēs*, diver). Generic name for the larger carnivorous water beetles common in ponds throughout Great Britain. They swim with considerable speed, but have to come to the surface to obtain a fresh supply of air, which is stored under the wing-cases for breathing when under water. They prey on tadpoles and on other insects. See Beetle.

THE ancestor of the letter E in the earliest Egyptian hieroglyphic writing (5000-4000 B.C.) was , representing an aspirate rather than a vowel. The later hieratic form was , a sign adopted in the Semitic alphabet, in which the letter was known as *he* (pronounced *ha*), meaning window, but it was somewhat modified in shape, being turned on end and given a tail, thus . The Greeks, whose writing ran from left to right, i.e. in the opposite direction to that of Phoenician and Hebrew writing, found it con-



venient to reverse the letter, which by about 500 B.C. had become the classic Greek **E**, or *epsilon*, with the minuscule forms **e** and **ε**. The Greeks were the first to use it as a vowel, its original long sound being "ey" which is how the name of the letter is usually pronounced in other languages than English which employ the Roman alphabet. The Latin form added the usual refinement of serifs, and from the Latin minuscule **e**, written with a single penstroke, was derived the formal lower-case e of the printer.

**E** Fifth and most frequently used letter, and the second vowel of the English and Latin alphabets. Its chief sounds are those heard in *me*, the Italian *i*, and in *men*, really the short sound corresponding to *a* in *mane*. In words like *there*, *here*, *her*, the pronunciation is influenced by *r*. In *clerk*, *Derby*, *e* has the sound of *a*. As a rule, *e* final is itself mute, but its usual effect is to lengthen the preceding vowel; e.g. *mat*, *mate*, but *give*, *live*. *E* following *c* and *g* usually softens these consonants, e.g. *fence*, *certain*, *gender*.

The combination of *e* with other vowels represents various sounds: *ea* usually *ee*, as in *meat*, but at times as in *bread*, *head*, *great*, *pear*, *heart*; *eau* in French words is a long *o*, as in *portmanteau*, but in *beauty* as *iu* (*yu*). *Ei* is a long *a* or *ee*, as in *weight*, *deceit*, but has a short *i*-sound in *foreign*, *sovereign*, sometimes long as in *height*, *neither* (also *neether*). *Eo* is a long *ee*, as in *people*, but *yeoman* is an exception; in words like *gudgeon*, *surgeon*, the *e* is introduced to soften the preceding *g* and does not affect the following vowel.

The continuations *eu*, *ew* have the sound of *iu* (*yu*), as in *deuce*, *new*, but of *o* in *sew*. In *ey* when accented, the sound is that of a long *a*, as in *purvey*, but when unaccented, as in *valley*, the sound approaches that of short *i*. *Key*, like its homonym *quay*, is pronounced *kee*. See Alphabet; Phonetics.

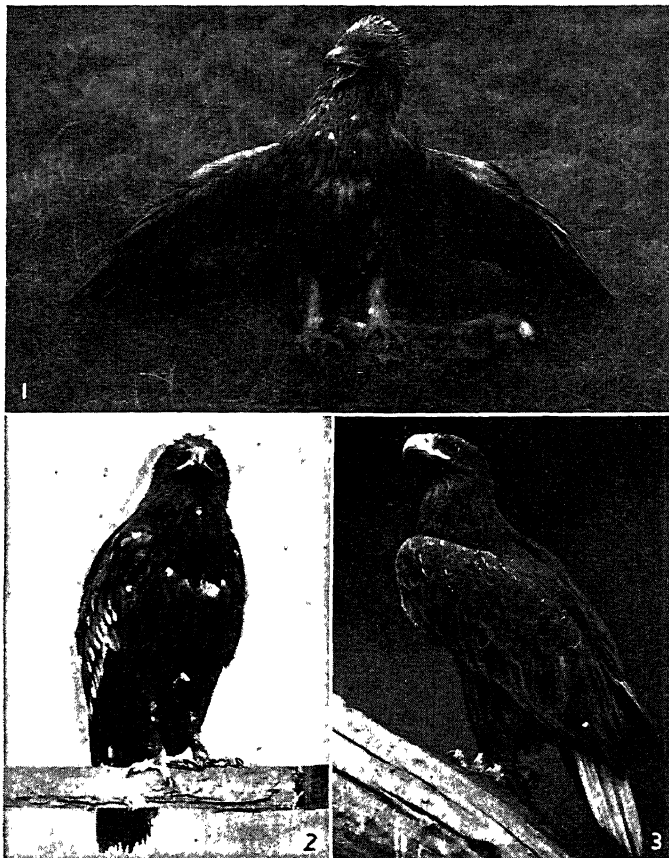
**E**. In music, the third note of the natural scale of C. **E** is two whole tones higher than C. See Key Signature; Pitch; and entries under the other letters.

**Ea**. God of Babylonian mythology. He is said to have arisen out of the Persian Gulf, bringing with him the elements of culture. He was the god of wisdom and of life, the trees of which grew under his protection in the Babylonian Paradise, which was watered by the rivers Euphrates and Tigris created by him at the beginning of time. He was also known as the potter who moulded gods and men.

**Eadmer** OR **EDMER** (d. c. 1124). English historian. Brought up a monk at Canterbury, he became the intimate companion of Archbishop Anselm. Elected to the archbishopric of St. Andrews, Scotland, 1120, he refused to be consecrated except by the archbishop of Canterbury, and on the Scottish king's denying the jurisdiction of Canterbury, Eadmer remained in England, and eventually renounced his claims to the see. He wrote a life of S. Anselm and *Historia Novorum*—the latter

an English history from 1066 to 1122. Both works were edited by M. Rule, for the Rolls Series, 1884.

**Eagle** (Fr. *aigle*, Lat. *aquila*). Group of large birds of prey, including some fourteen genera and a large number of species. True eagles belong to the hawk family Falconidae, of which they are the largest members. All have strong curved beaks with sharp cutting edges, and the head has usually a flattened and rather snakelike look. The plumage is generally dark, and the wings are long and powerful.



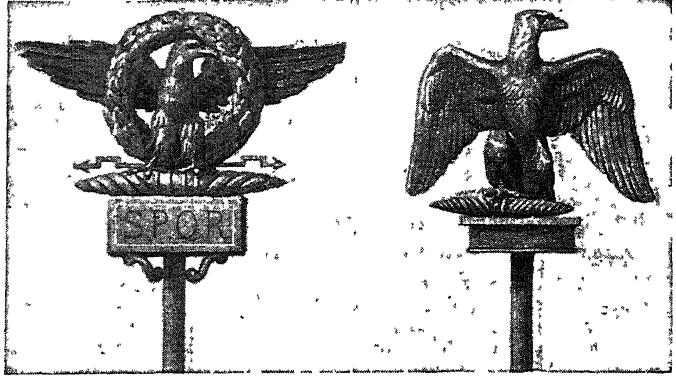
**Eagle.** Examples of this large bird of prey. 1. Golden eagle, with prey, not uncommon in Scotland and Ireland. 2. Spotted eagle, occasionally found in the British Isles in winter. 3. White-tailed sea eagle, found in the Hebrides

All are exclusively carnivorous, and most of them eat carrion. They are found throughout Europe, Africa, Asia, and North America.

The most familiar member of the genus *Aquila* is the golden eagle (*A. chrysaetus*), which is not uncommon in Scotland and in the wilder parts of Ireland. The golden eagles seen in England have always turned out to be white-tailed species. The bird is about a yard in length, with dark brown plumage showing a tawny tinge at the neck. It lives mainly on hares, rabbits, and game birds, and will occasionally attack a lamb or young fawn. Its nest, made of sticks and often of a huge size, is usually built on a ledge of an inaccessible cliff. The white-tailed sea eagle (*Haliaetus albicilla*) is found in the Hebrides. The spotted eagle (*A. clanga*) is a rare winter visitant. See Beak illus.

**Eagle.** Symbol in heraldry. It was employed by several nations before the beginning of heraldic science, notably by the Hittites, Persians, and Egyptians. In heraldry it is almost universally displayed full front, with expanded wings, but is shown in a great variety of positions, as close (wing closed), rising (wings elevated or displayed), volant or flying, trussing or preying (devouring quarry), and double-headed, in which form it was adopted by the Russian and Austrian empires.

From a Roman standard-symbol it became the emblem of the rulers of the Eastern Empire, from whom Charlemagne adopted it after his coronation at Rome in A.D. 800, thus making it the badge of the medieval empire. From this early form was evolved the later German imperial eagle, which, originally one-headed, is represented on the coins of the emperor Louis the Bavarian as double-headed, to typify the union of the royal and imperial dignities. This continued



Eagle. The bird as displayed on military standards. 1. Of the armies of Ancient Rome 2. Of those of Napoleon I and Napoleon III

to be the basis of the arms of the Holy Roman Empire till its close in 1806. The Austrian Empire preserved the double-headed eagle. The Russian tsars assumed the double-headed form in 1472 under Ivan III. to signify their succession from the Greek emperors. The modern German Empire adopted the single-headed eagle on its formation in 1871

The origin of the assumption of the eagle as a national emblem by the United States of America is obscure, but there is good reason to believe that it was adopted from Indian usage. Its images, carved in wood, or its stuffed skin, surmounted the council lodges of the Creek Indians, its feathers composed their war flag; and it was worshipped by the Natchez, Alanzas, and other tribes. The American eagle carries in its talons a bundle of arrows and an olive branch, bears on the breast a shield crossed by six red vertical bars, and from its beak issues a band with the motto *E pluribus unum*. The eagle was adopted by the Mexican Republic because of an Aztec legend that when the site of Mexico City

was discovered an eagle with a serpent in its talons was seen perching on a cactus plant. The alerion is an heraldic form of the eagle, without beak or legs.

**Eagle.** Name given to a military standard in Rome, Persia, France under Napoleon I and III, and Germany under Hitler. In Rome the eagle was traditionally believed to have brought the symbols of earthly power to King Tarquinius Priscus, and was first adopted as a military emblem in the second consulship of Marius (104 B.C.), when the older tribal standards were laid aside and the eagle, as the bird of Jupiter, was alone retained. It was at first made of wood, but later was cast in silver and bronze, with expanded wings, the model being small.

In the time of Cyrus, the Persian military ensign was a silver eagle with wings outstretched. In 1148 the Teutonic Knights adopted the eagle as their standard.

The Napoleonic eagle, which was served out to regiments and vessels of war, was represented as gilded and crowned and perched on a thunderbolt. It was first issued on Dec. 3, 1804, the day after Napoleon's coronation, and the officers who received it took oath to "sacrifice their lives in defence" of the standard. Twelve Napoleonic eagles are preserved at the Chelsea Hospital, London, but the only naval eagle known is in the museum at Madrid. On the restoration of the Bourbons, the eagles in use were destroyed, but when Napoleon returned from Elba new eagles were issued. After Waterloo another destruction of eagles was ordered, and only one of those which had not been captured by the British—that of the Old Guard—was saved, remaining in possession of the officer who secreted it. The older Napoleonic eagles bore only the number of the regiment,



Eagle. Representations of this bird on the flags and standards of various nations. 1. Taken from an Egyptian coin of the time of the Ptolemies. 2. Ancient Rome. 3. Holy Roman Empire. 4. Austria 5. German Empire. 6. Russian Empire. 7. U.S.A. 8. Mexico

but those made in 1815 bore the legend L'Empereur des Français, and the names of the four principal engagements in which the regiment had taken part. The practice of carrying eagles in French regiments was restored by Napoleon III in 1832, but once more abolished by the republic in 1870.

In 1934 Hitler introduced the eagle as the standard for German regiments; the emblem surmounting the staff on which the colours were carried.

**Eagle.** Gold coin worth ten dollars, formerly current in the U.S.A. It bears a representation of the U.S. crest, an eagle. First coined in 1795, it became the standard gold coin. Later double, half, and quarter eagles were authorized, and \$3 and \$1 pieces. In 1934 further coinage of gold and the use of gold coins was forbidden by the Gold Reserve Act.

**Eagle Owl (*Bubo*).** One of the largest members of the owl family.



Eagle Owl, a nocturnal bird of prey

Occasionally found in Great Britain, it is over 2 ft. long, with handsomely mottled brown plumage and conspicuous ear-tufts. It is nocturnal in habit, bold and savage, and preys upon game birds, rabbits, and young fawns.

**Eagle Squadron.** Unit of the Royal Air Force, formed on Oct. 8, 1940, from U.S. volunteers, many of whom had already served in the French air force during the battle of France. By Dec., 1941, there were three Eagle squadrons operating with Fighter Command; their honorary commanding officer was Gp. Capt. Charles Sweeney, a veteran of the First World War. When the U.S.A. came into the war the men serving in these squadrons transferred to the U.S.A.A.F., but retained the right to wear the R.A.F. brevet on their tunics.

**Eaker, Ira CLARENCE** (b. 1896). American soldier and airman. Born at Field Creek, Texas, he studied at Southern California and Columbia universities, and was commissioned as lieutenant in 1917. He served in the Philippines, 1919-22, where he transferred to the Army Air Corps, making many notable flights. In 1942, as brig-

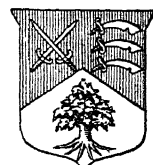


Ealing, Middlesex. The Town Hall situated on the Uxbridge Road, a main road running west out of London

gen., he commanded first the U.S. bomber command in the U.K.; then the 8th bomber command of the U.S.A. 8th A.F. in the European theatre of operations (leading on Aug. 17, 1942, the first all American raid in W. Europe, a day attack by 12 Flying Fortresses on Rouen railway marshalling yards); and from Nov. the U.S.A. 8th A.F. Promoted lieutenant-gen. Dec., 1943, Eaker commanded the Allied air forces in the Mediterranean from Jan., 1944, until the spring of 1945. He retired in July of that year. He was the author of several books on aviation.

**Ealing.** Parl. and mun. bor. of Middlesex, England. It is  $5\frac{1}{2}$  m. W. of Paddington by main rly., and has five stations on London underground rlys. Until

a borough. Since 1926 it has included Hanwell and Greenford; since 1928 Northolt. The chief



Ealing arms

buildings include the Victoria Hall, the town hall, and Christ Church, Uxbridge Road. The parish church is St. Mary's. Perivale, formerly a rural part of Ealing, has a tiny church 800 years old. Open spaces include Ealing Common and Walpole Park. At Ealing is the first British film studio to be built, 1931, for sound; productions included *Next of Kin*, 1941; *The Captive Heart*, 1946; *Passport to Pimlico*, 1949. Pop. est. 163,650.

## THE EAR: ITS ORGANISM AND FUNCTIONS

J. Cecil Hogg, F.R.C.S., Surgeon to the Ear, Nose and Throat Dept., St. Bartholomew's Hospital

*This article, describing the complicated physical characteristics of the organ of hearing in man and certain other creatures, explains also the functions of the ear apart from its auditory power. See also Deafness.*

The ear is the organ of hearing; more strictly it contains the specialised structures forming the end organ of the eighth cranial nerve. It has two separate functions: it collects and concentrates the vibrations known as sound waves, and transmits them to the nerves, in order that they may be perceived and interpreted in the brain; and it harbours the chief organ of balance or equilibration.

The ear is divided into three parts:

(1) The outer ear, composed of (a) the auricle or pinna, the concave structure applied to the side of the head, which leads into (b) the external auditory meatus, a narrow tube passing inwards to the tympanic membrane or drum of the ear. The outer ear is com-

posed chiefly of a framework of cartilage covered by skin. In many animals the pinna is large, has a considerable degree of mobility, and its meatus can be narrowed or widened at will. The skin lining the deeper external auditory meatus is closely adherent to the subjacent cartilage and bone. The skin glands in the outer third of the meatus are modified into ceruminous glands, which secrete a semi-solid substance of a waxy nature—the ear wax. In some cases excessive formation of wax will lead to sudden deafness by totally occluding the outer ear:

(2) The middle ear is a narrow cleft-like air space in the temporal bone of the skull, separated from the outer ear by the ear drum. Situated within this cavity is a



chain of three minute bones, the malleus (hammer), the incus (anvil), and the stapes (stirrup). The malleus is attached to the outer surface of the ear drum, and the stapes to the membrane of the oval window, a small membranous gap in the outer wall of the inner ear. The incus occupies an intermediate position, being hinged and attached to both the malleus and the stapes. Sound waves reaching the drum are in this way conveyed to the membranous oval window of the inner ear.

#### The Work of the Middle Ear

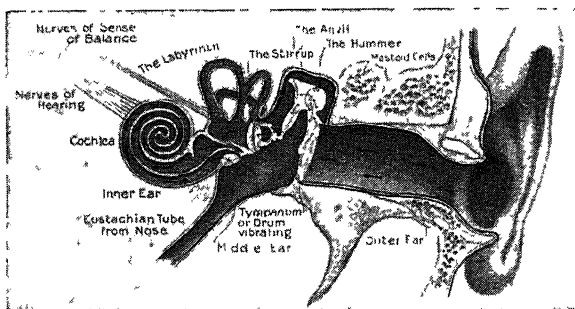
The middle ear in addition transmits in its wall the nerve of expression, the facial, and its branch the chorda tympanica, an important nerve of taste. In front the eustachian tube forms a direct communication between the middle ear and the throat. In health this allows air to pass into the middle ear during the act of swallowing, in order that the pressure of air inside the drum may equal that of the atmosphere. Since the middle ear also communicates above and behind with the air cells of the mastoid bone, behind the auricle, inflammatory processes starting in the nose or throat may extend via the middle ear to the mastoid process, giving rise in severe cases to a mastoid abscess.

These structures are in very close relationship to the brain and its covering membranes, and all middle ear inflammations are therefore dangerous. It is noteworthy that the introduction of sulphonamide and penicillin treatment has materially reduced the incidence of mastoiditis by cutting short the inflammatory process in its early stage, and has also provided a potent means of treatment of its complications. These remedies, however, are not in all cases adequate, and surgical treatment may be necessary to prevent chronic ear disease and deafness.

(3) The inner ear is a bony cavity embedded in the base of the skull deep in the middle ear, with which it communicates by two membranous openings, the oval and round windows. It is filled with fluid called perilymph, suspended in which are the hollow fragile membranous structures of the cochlea and the semicircular canals. These membranous tubes

also contain a liquid called endolymph. The cochlea is a spiral tube, consisting in man of about two and a half turns, and has been compared to a snail's shell. The nerve of hearing terminates in it, in a multitude of minute hair cells which float in the endolymph. Sound waves are carried through the outer and middle ear, and put the membrane closing the oval window in action, which in turn is communicated to the perilymph fluid filling the bony inner ear. The movement of this fluid is transmitted through the membranous cochlea to the endolymph, and thus to the hair cells which form the termination of the nerve of hearing. The stimulus thus given to the nerve is perceived in the brain as sound.

In a certain form of deafness, known as otosclerosis, there is a deposit of vascular spongy bone, chiefly around the oval window.



Ear. Diagram showing path of sound waves to the brain

This in time leads to a fixation of the footplate of the stirrup bone or stapes, with consequent interference in the transmission of sound waves to the inner ear. The operation by surgical means of a new artificial membranous window into the inner ear, the fenestration operation for otosclerosis, has been increasingly carried out in late years, both in Europe and America. There is often a marked temporary improvement in the hearing, but as yet permanent relief of the deafness is exceptional.

The semicircular canals of the inner ear are three bony semicircular tubes joined together at right angles to one another, and opening at both ends into a small cavity known as the vestibule, which unites them to the cochlea. Like the cochlea they are filled with perilymph fluid, in which is found the membranous organ containing the hair cells, floating in endolymph. Any movement of this fluid stimulates the nerve. The

fluid is set in motion by any change in position of the body. The stimulus thus produced is carried to the brain, and enables it to judge of the position in space, and automatically to adjust the muscles accordingly. It is believed that the semicircular canals are concerned with reactions to movement, whereas reactions to position are the concern of the hair cells in the vestibule.

**FUNCTIONS OF THE EAR.** The cochlea is the only part of the inner ear concerned in hearing. It is absent in fishes, first appears in amphibia and reptiles, increases in birds, and attains its maximum perfection in the mammals. Destruction of the cochlea produces total deafness.

Sensations of sound are distinguished by three characters—loudness, pitch, and quality or timbre. Loudness depends on the amplitude of the sound waves, and the distance from the ear of the observer. The pitch depends on the number of vibrations occurring in a given time. Man can detect sounds with a pitch ranging between 16 and approximately 22,000 vibrations per second. There is reason to believe that many animals can appreciate sounds of higher pitch, whereas the sensory cells of the fish which correspond

with the mammalian cochlea are capable of perceiving only vibrations of very low frequency—6 per second. The quality or timbre of a sound depends on the manner in which the vibrations succeed one another. If these are irregular a noise is produced, if regular and orderly a musical note.

#### Tests for Location of Deafness

In the investigation of deafness standardised tests are used by the physician to determine the type of the lesion and its degree. By tests with tuning forks, ranging in frequency between C16 and C4096 double vibrations, it is possible to determine whether the lesion is in the inner ear, in which case the deafness is mainly for the high tones, or in the middle ear, when there is loss of appreciation of the lower frequencies. An estimate of the degree of deafness can be formed by measuring the hearing distance for the voice, or some simple mechanical instrument such as a watch or a clock. An

electrical instrument, the audiometer, makes it possible to test hearing for pure tones with accuracy between approximately 60 and 12,000 vibrations. By plotting the results of the audiometer test graphically, both the type and the degree of deafness can be readily assessed.

Equilibration is a second function of the ear. In balancing himself a man normally depends on his sense of sight, his muscles, and the stimulus to his brain from the fluid in his semicircular canals, with their vestibule. It is doubtful if the canals themselves convey any sense of position. This may be realized in flying, where in a banking aeroplane the first sensation may be that the horizon, and not the machine, is tilting. Experienced aviators flying through cloud can sometimes estimate the angle of the machine by the direction of the pull of the straps which hold them. Sudden movement or acceleration of the head in any direction produces movement of the endolymph in the canal, with stimulation of the hair cells which float therein. As the three canals are arranged in planes at right angles to one another, like three adjacent sides of a cube, the fluid in them moves in a different way with each change of position in space. Unusual or violent agitation of the endolymph, such as is produced in flying or sailing, gives rise to disagreeable sensations, well known as air sickness or sea sickness. A simple method of preventing the motion of the ship from affecting the canals is to place sterile gauze into both ears, packing it against the drum until there is a definite sense of pressure in the ear.

The semicircular canals and the eyes are closely connected via the central nervous system. Stimulation of the former produces quick jerking movements in the latter, known as nystagmus. Nystagmus may also occur in certain nervous diseases, and is not uncommon among coal miners, when the person affected is asked to look far over to one or other side. Similarly if a passenger in a moving train looks out of the window for a time, the effort he makes to "fix" a moving object—that is, to preserve a constant field of vision—produces the to and fro movement of the eyes which is called nystagmus. In miners it is probably caused by efforts to "fix" objects in a poor light.

When a physician wishes to investigate the condition of the

semicircular canals, he does so by inducing nystagmus: the patient is rotated in a revolving chair, about 10 turns in 20 seconds, which strongly stimulates the nerves in the canals, with production of nystagmus lasting upwards of half a minute in a normal subject. Another even more valuable test is the caloric test, in which the ear is syringed with water at temperatures below or above blood heat. This sets up convection currents by cooling or warming the endolymph fluid, with consequent production of nystagmus and giddiness. Absence, or delay in onset, of nystagmus is clear evidence of a disorder of the semicircular canals.

**Earhart, AMELIA** (1898–1937). Maiden name of Mrs. G. P. Putnam, American airwoman. Born



Amelia Earhart, American airwoman

at Atchison, Kansas, July 24, 1898, she entered Columbia university and later took up social work among children in Boston. On June 17, 1928, she became the first woman to fly the Atlantic, and on May 20–21, 1932, made the first solo crossing of that ocean by a woman, her time of 13½ hrs. being a record. She flew the Pacific from Honolulu to Oakland, Calif., in 18½ hrs., on Jan. 12, 1935. In March, 1937, with two companions she began a round-the-world flight, but crashed at Honolulu after four days; and early in July she was lost in the Pacific after setting out from New Guinea. She married G. P. Putnam, the publisher, in 1931.

**Earl.** Title in the British peerage, ranking third after duke and marquess. The French equivalent is comte, and the German is Graf. The wife of an earl is called a countess, a reminder of the days when earl and count were synonymous. His eldest son bears his father's second title; the other sons are known as the Hon., the daughters prefix Lady to their first names. Including Scottish and Irish titles, there are over 200 earls in the peerage.

Earl is the oldest title of nobility. Under the former earl it first appeared in England in Anglo-Saxon times, being used for those of noble blood as distinguished from the ceorls. In the 11th century, Canute set rulers over parts of the country. He named them jarls, a Danish

word, but this became earl in England. This idea remained, and after the Conquest most of the counties had an earl as the head of their administration, he being entitled to the third part of its revenues. These earls were sometimes called after their residence, but gradually it became general to call them after their county. The office was not at first an hereditary one, but some earls managed to make it so. They corresponded to the counts, rulers of counties in France and other parts of Europe.

Gradually the title became a mark of rank rather than a mark of office. Earls who had no connexion with the rule of a county began to be created in the time of Edward III, and following the first creations of the higher ranks of duke and marquess, they took their present place in the peerage, the title carrying with it the right to a seat in parliament. The premier earl of England is the earl of Arundel, a title held by the duke of Norfolk. Of those who have no higher title, the earls of Shrewsbury (1442), Derby (1485), and Huntingdon (1529) are the senior. In Scotland the earl of Crawford is the senior earl, dating from 1089. See Peerage.

**Earle, JOHN** (c. 1601–65). English divine. Born at York, educated at Merton College, Oxford, and successively dean of Westminster, bishop of Worcester, bishop of Salisbury. He wrote *Microcosmography* (1628), a valuable reflection of contemporary life. He was buried in the chapel of Merton College.

**Earl Marshal.** In England the eighth great office of state.



Earl Marshal of England. The 16th duke of Norfolk, hereditary holder of this office



Earl's coronet

The holder of the office is head of the Heralds' College and has various ceremonial duties. Since 1672 the office has been hereditary in the family of Howard, dukes of Norfolk. On the death of the 15th duke, 1917, his brother, Lord Edmund Talbot, was appointed deputy earl marshal, the

16th duke being a minor until 1929. Until 1386 the title was marshal. With the lord high constable he was judge of the court of chivalry. The office of earl marischal (formerly great marischal) of Scotland was hereditary in the Keith family until the attainer of George, the 10th earl marischal, in 1716, when it was abolished.

**Earl's Court.** District of Kensington, London, with an underground rly. junction. Earl's Court has been synonymous with exhibitions since the original building was opened in 1884; in the grounds was the Great Wheel, removed in 1906. During the First Great War the grounds accommodated 100,000 war refugees. The building then fell into disuse until reconstructed and reopened in 1937; thereafter Earl's Court housed the Motor show, part of the B.I.F., and other trade shows, and the main hall was used as a boxing stadium seating 18,500. Here is also the Empress Hall, with an ice rink. Pop. 18,500.

**Earlston.** Parish and small town of Berwickshire, Scotland, formerly Ercildoune. It stands on Leader Water, 32 m. by railway S.E. of Edinburgh, and is a noted angling resort. There are traces of the old tower of Thomas the Rhymer (d. 1299) Pop. 1,800.

**Early, JUBAL ANDERSON** (1816-94). American soldier. Born at Franklin, Virginia, Nov. 3, 1816, and educated at West Point, he practised as a lawyer, 1838-52. Though a supporter of the maintenance of the union he threw in his lot with the Confederates on the outbreak of the Civil War. At the first battle of Bull Run he commanded a brigade, and at Fredericksburg and Gettysburg a division. A succession of defeats by Sheridan and Custer, in 1864, led to his being relieved of his command in 1865, yet competent authorities regard him as the best Confederate general after Lee and Jackson. He was the author of *A Memoir of the Last Year of the War for Independence, 1867*, and other military and historical writings. He died at Lynchburg, Virginia, March 2, 1894.

**Early, STEPHEN TYRES** (b. 1889). U.S. journalist. Born at Crozet, Virginia, Aug. 27, 1889, he went to elementary and high schools, and became a journalist soon after completing his education. A member of the Washington Staff United Press Association in 1908, and publicity director of the U.S. Chamber of Commerce in 1920, he was assistant secretary to

President F. D. Roosevelt, 1933-37, and thereafter secretary until Roosevelt's death in 1945.

**Early Closing.** Movement among shopkeepers and others which secured shorter working hours on week days. In 1886 the Shop Hours Regulation Act limited the working time of young persons under 18 employed in shops to 74 hours a week, the Shop Hours (Amendment) Act of 1893 contained provisions for the appointment of inspectors. In 1904 another Shop Hours Act introduced the principle of closing by local option by a two-thirds majority. The shop-assistants' charter, however, was the Shops Act of 1912, which consolidated previous legislation and gave a compulsory half-holiday on one day of the week.

Under the Shops Act, 1934, shops with certain exceptions must be closed by 8 p.m. every day in the week except one, usually Sat., when they must be closed by 9 p.m. Local authorities may also make orders requiring shops to close at some hour fixed by them not earlier than 7 p.m. They must be satisfied that at least two-thirds of the shopkeepers approve. During the Second Great War closing hours as early as 4 p.m. were imposed under Defence Regulations. Ordinarily no one under 16 may be employed about the business of a shop more than 44 hours a week, no one between 16 and 18 more than 48 hours a week. In not more than six weeks in a year during periods of seasonal or exceptional pressure, persons between 16 and 18 may work overtime for a maximum period of 12 hours in any week or 50 hours in any year.

**Early English.** Style of architecture originating c. 1170 in the reign of Henry II, and prevalent throughout the 13th century. The term is also used for a period of literature covering about the same years as the architectural one (see *English Literature*).

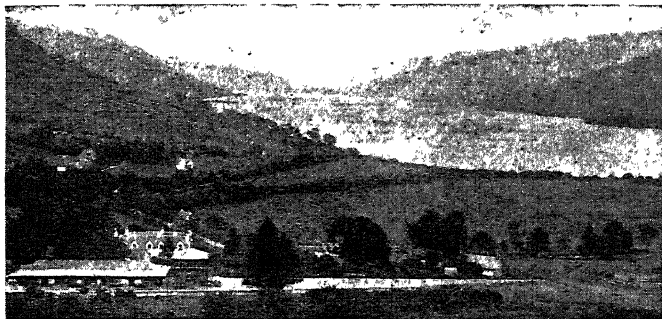
Architecturally it has been called the "lancet" style or period, from the resemblance of the slender pointed arch, its leading characteristic, to a surgeon's lancet. Norman work had retained the round arch of Romanesque pattern, and Early English inaugurated the new era of Gothic architecture by substituting the pointed for the round. In essence, Early English indicates a revolt against the slightly uncouth forms of the Romanesque style in England, and a striving after more elegant forms of con-

struction and ornament. Vaulted roofs in stone take the place of the old flat timber roofs. Windows are lengthened and crowned by the lancet arch; piers are formed of clustered columns, each having its own cap, but united under one capital from which spring the trefoiled pointed arches of the vault; mouldings are deeply undercut, often with dog-tooth ornament; the entire design becomes more elegant and flexible.

The choir of Lincoln Cathedral (12th-13th century) is one of the earliest and most beautiful extant examples of Early English architecture. The choir and Lady Chapel of Southwark Cathedral, still preserved, were built in 1207; the stone-webbed vault of this fine Early English church is an example of the style at its best. In other English cathedrals portions of Early English work are still preserved, notably at York Minster, Westminster Abbey, Salisbury, Durham, and Ely. The plan of churches built in this period shows the absence of the semicircular apse which was characteristic of Norman and Romanesque structures, and the substitution of a square east end; and the transepts generally divide the length into two almost equal parts. It is noticeable that the Early English style was coincident with a movement within the Church towards simplicity and reticence. The Reformed Orders, especially the Cistercians, were largely responsible for an architectural development which, beginning with a lightness and beauty unknown to the Norman period, was to attain, in the Decorated and Perpendicular styles which followed it, an ever-increasing magnificence. See *Architecture*; *Gothic Architecture*; also *Arch illus.*

**Earmark.** Term used in English law to signify a sum set apart for a particular purpose. For example, when executors have to pay a legacy to a person, say at 21, and they set aside and invest for that purpose some particular fund apart from the general investment of the estate, it is said to be earmarked for the legacy. The term originated in the practice of marking beasts by cuts in the ear, for identification purposes.

**Earn.** Loch of Perthshire, Scotland, about 11 m. W. of Crieff. Lying 317 ft. above sea level, it is  $6\frac{1}{2}$  m. long and  $\frac{3}{4}$  m. wide, with a maximum depth of 287 ft. Trout are plentiful. The lake occupies a rock basin scooped out by the ice sheet which crossed Perthshire



**Earn.** View of the loch looking eastward from Lochearnhead

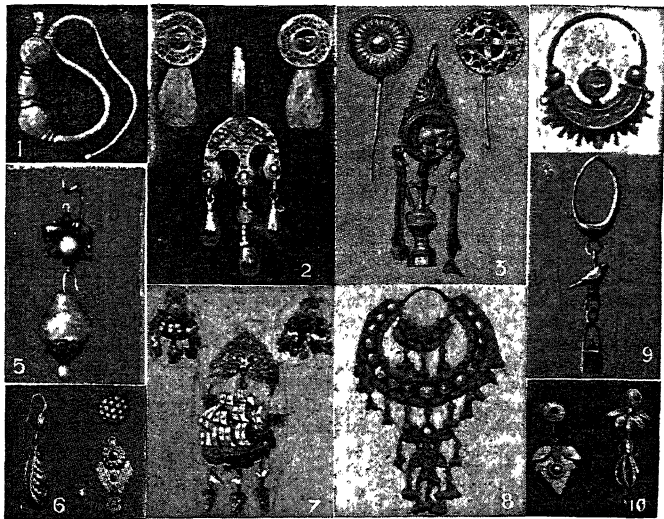
during the Ice Age. Scott's Legend of Montrose introduces Ardvorlich House, on its shore, as Darrlin-varach.

**Earn.** River of Perthshire, Scotland. It issues from Loch Earn and flows E. for 46 m. across Strathmore to the Tay, which it enters 2 m. N.E. of Abernethy. Salmon, trout, and other fish abound. It is subject to floods, but small vessels, not exceeding 50 tons, can approach Bridge of Earn.

**Earnest.** Name given to a sum of money paid on account in order to show the good faith of the buyer. Such payments are recognized in English law, and also in other codes, the fact that such has been made being taken as proof that a contract has been entered into. Strictly speaking, earnest is not part

payment, although it has some similarity with the arrha of Roman law which was such. See Contract.

**Earring.** Object attached to the ear, usually by passing it or a subsidiary ring or hook through the lobe. Its purpose may be amuletic, ceremonial, or ornamental. Untraceable in the prehistoric stone age, earrings appear early in the metal age in the form of plain bronze and gold bands or wires, sometimes twisted, sometimes with one end clubbed. In the Swiss lake-dwellings, which have yielded hundreds of specimens, occurs a double-coil design which survives among the Sumatra Battas. In ancient Egypt the simple hoop developed complex forms, with animal head terminals and gems, partly under foreign influence

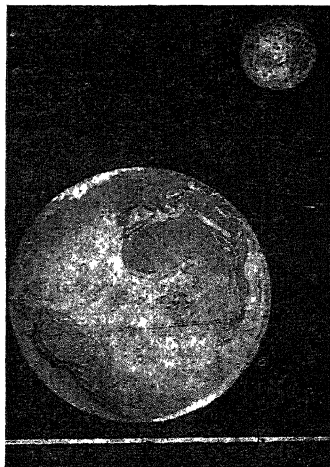


**Earring.** 1. Ancient Egyptian, mounted with beads. 2. Gold with jacinth drops, on either side, pierced earrings with emerald matrix drops, all three Roman. 3. Ancient Greek gold earring set with jewels and enamels, c. 400 B.C. (centre); small Roman earrings of gold. 4. Enamelled Byzantine, set with pearls. 5. 16th century Italian, pearl set in gold. 6. Left, turquoise, c. 1840; right, modern Italian set with seed pearls; above, turquoise, c. 1840. 7. 16th cent. Italian, shaped like a ship in full sail; on either side, 16th cent. Venetian pearl pendants for earrings. 8. Modern Indian, set with diamonds and emeralds. 9. Phoenician earring from Tharros. 10. Modern Italian, gold set with seed pearls

From *Chats on Old Jewellery*, by MacIver Percival; and *Jewellery*, by Cyril Deaconport  
By courtesy of T. Fisher Unwin and Methuen & Co.

Except in Babylonia and Assyria these ornaments were usually confined to women. Many O.T. references to such rings properly concern nose-ornaments; that mentioned in Isaiah 3 was an amulet. The development of design is observable in Mycenae, Troy, Etruria, and S. Russia, through the winged sirens of Greece and the pearls and other jingling jewels of imperial Rome to the massive pendants of the Byzantine age.

Dormant during the Middle Ages, the use of earrings revived after the Renaissance. Mediterranean mariners introduced the single plain gold hoop to the seafaring world, where it is still in favour. In modern India rings may have a

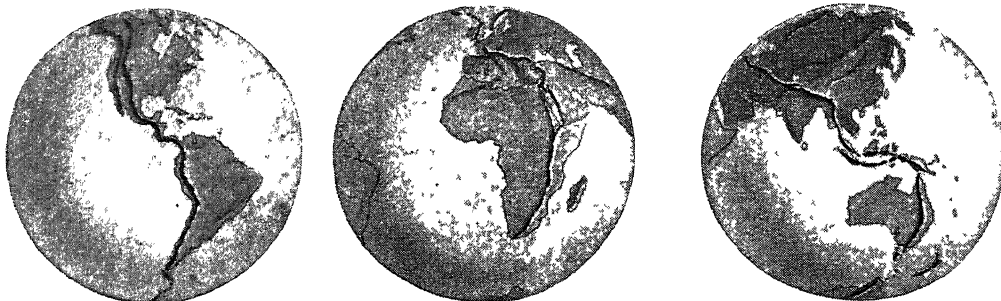


**Earth.** Diagram to show the relative sizes of the earth and its satellite, the moon. The white band below indicates the distance between them on a scale where the width of the band equals the earth's radius

hundred pendant pearls, with supporting chains over the top of the ear, or the ear may have 12-13 borings, each with a separate ornament. Garo women sometimes wear 50 brass rings in each ear. Silver is preferred by Syrian women; other materials are the iron wire of the Dinka, shell of the Hottentots, cuttlefish bone of Formosa, and tortoiseshell of the Solomon Islands. See Mutilation Customs.

**Earsdon.** Parish and urban dist. of Northumberland, England. It is 4 m. N.W. of North Shields, and the inhabitants are employed in the local collieries. Pop. 13,086.

**Earth.** Name of the planet on which we live. The word is also applied to the soil of the external crust. The earth comprises a gaseous atmosphere, which is studied in meteorology (*q.v.*), a solid crust or lithosphere, studied in geology (*q.v.*), surface waters



**Earth.** Three views of the earth showing the three mountain ridges which meet in the plateau of Antarctica. These ridges indicate the shape which is being assumed by the earth's crust as the earth itself cools and contracts

called the hydrosphere (*see* Ocean) and an interior of which the structure can only be deduced and not directly observed (*see* Geophysics; Seismology). The mapping and study of the surface features of the earth are the province of geography (*q.v.*).

Primitive ideas of the earth nearly always conceived it as a flat disk surrounded by water and supported on foundations which allowed the sun, moon, and stars to complete their passage below ready to rise again and circle the celestial dome above the earth. Pythagoras was the first to suggest a spherical form, and Aristotle lent the weight of his authority to the idea. The arguments for sphericity—the gradual disappearance of ships hull first; the shape of the earth's shadow during eclipses of the moon; variation in the constellations visible as the observer changes his latitude—were, however, not generally regarded as convincing till the globe was circumnavigated in 1519. It is now known that the earth is approximately a sphere flattened slightly at the poles, the polar diameter being 7,900 m. and the equatorial 7,926 m.

#### The Four Divisions

The atmosphere, which consists at the surface of 75 p.c. nitrogen, 23 p.c. oxygen, and 2 p.c. rare gases, with variable amounts of water and carbon dioxide, extends in an attenuated state to an altitude of some 500 m. (*see* Aurora). The solid surface is diversified by hills and valleys believed to be due to the shrinking of the crust on a cooling core; the highest peak rises to 29,000 ft. above sea level, the lowest depths of the sea slightly exceeding this figure. There is nearly three times as much surface covered by water as dry land, and the distribution is strikingly uneven (*see* fig.). The surface rocks may be igneous, i.e. formed from molten material, or sedimentary. The

former are largely composed of silica, free or in combination with the oxides of aluminium, potassium, sodium calcium, magnesium, and iron. The latter are formed by denudation and chemical action from the former, and consist of the sand, clay, and carbonates familiar, for example, in S.E. England. The oceans consist of water containing 3.5 p.c. of dissolved salts, mainly the chlorides of sodium and magnesium and the sulphates of magnesium, calcium, and potassium. Present evidence suggests that there exists a central core 4,500 m. in diameter of metals in a quasi-fluid state, surrounded by a mantle of silicates, basalt, and granite.

#### Temperature and Specific Gravity

At the surface the temperature is controlled by radiation from the sun and therefore varies with latitude, the annual mean being about 85° F. at the equator and 0° F. at the poles. The rate of increase with depth in the surface layers is about 50° F. per mile, but this is due largely to radioactivity in the outer crust and the temperature gradient is probably not maintained inwards: the central core is unlikely to be hotter than 5,500° F. Lava flow from volcanoes is an index only to the conditions in local pockets close to the surface.

The mean specific gravity of the earth as a whole is 5.52, but that of the surface rocks is only about 2.7. At the boundary of the metallic core (roughly halfway to the centre) the specific gravity is about 7, and it may reach 12 at the centre. This progression is due partly to increase of pressure as well as to change of constitution. The pressure must reach a million atmospheres at a depth of 1,300 m., 2 million at 2,200 m., and about 3½ million atmospheres at the centre. These pressures cannot be reproduced in the laboratory, and presumed physical properties

of matter under such conditions are largely based on extrapolation.

The earth is one of the smaller of the ten major planets which together with the asteroids and comets comprise the sun's family. It is third in order from the sun, its mean distance being 93 million miles as compared with 36 million for Mercury, the innermost planet, and 3,680 million for Pluto, the outermost. Its mass of 5,900 million million tons exceeds that of the lightest planet Mercury, by a factor of the order of 30, but is exceeded by that of the heaviest, Jupiter, by a factor of 318. It is remarkable in having a satellite, the moon, that is very much bigger in relation to the earth than is any other satellite in relation to its primary. Possibly the moon once formed part of the earth, but its great size (its diameter is more than  $\frac{1}{4}$  that of the earth) suggests that it may be an independently formed planet captured by the earth in past ages.

#### Rotation on its Axis

The earth rotates on an axis along its shortest diameter (N.-S. axis) from W. to E. in a period of 24 sidereal hours or 23 h. 56 m. of mean time. A point on the equator moves at over 1,000 m.p.h. as a result. The rotation produces the alternation of day and night and the apparent diurnal rotation of the heavens from E. to W. Until the time of Copernicus (d. 1543) this was supposed to be due to a real rotation of the heavens, and experimental proof to the contrary was not adduced till Foucault in 1851 showed, by hanging a free pendulum 200 ft. long from the dome of the Pantheon in Paris, that its plane, which is invariably in space, did not continue to coincide with the initial direction of swing inside the building. This was visible proof that the floor was in fact turning with the earth under the pendulum bob. The rotation of

the earth is utilised to provide the directive force of the gyro-compass.

The great circulations of air-masses in the atmosphere and of water in the ocean currents are controlled by the earth's rotation. In the N. hemisphere the wind spirals counterclockwise into a depression, while in the S. hemisphere the motion is clockwise. In both, the spiral character of the motion is due to deviations produced by the rotation in winds which start directed towards the centre of the depression. A similar deviation has to be allowed for in calculating the path of projectiles in gunnery.

The earth revolves annually at an orbital speed of about  $18\frac{1}{2}$  m. per second in an ellipse with the sun at one focus, the plane of the orbit being inclined at  $23\frac{1}{2}^\circ$  to the plane of the equator. This inclination causes the N. polar regions on June 21 and the S. polar regions six months later to be tilted towards the sun. At the first date the N. hemisphere ex-

tract one another with a force directly proportional to the product of their masses and inversely as the square of their distance apart. The earth attracts all objects close above its surface towards its centre with a force which increases their speed of free fall by 32 ft. per second every second. An acceleration similar though smaller (because of the greater distance) keeps the moon from flying away from the earth at a tangent to its orbit. The force of gravity is more at the poles than at the equator by about 1 part in 189, partly owing to the earth's oblateness but mostly to the centrifugal force associated with its rotation. The gravitational attraction of big mountain ranges such as the Himalayas causes the plumb-line to be deflected in their vicinity. Such masses, however, usually have strata of lower density than normal below them; and deep ocean basins, relatively light, are underlain by much denser rocks

The early history of the earth is largely a matter of conjecture, but its composition is consistent with the view that it once formed part of the sun and was torn off, together with the other planets, by some catastrophe, such as the close passage of another star, which created enormous tidal waves in the sun. The gaseous matter ejected first liquefied, the heavy elements sinking to the centre, and then a solid crust formed on which, as it cooled, life appeared and evolved. The time of solidification can be fixed by geological means, such as measuring the proportion of various products of radio-activity in rocks. Many lines of evidence suggest that it occurred about 2,000 million years ago. Present astronomical evidence makes it seem likely that the ultimate fate of life on the earth is extinction by heat as the sun's temperature rises in the course of time.

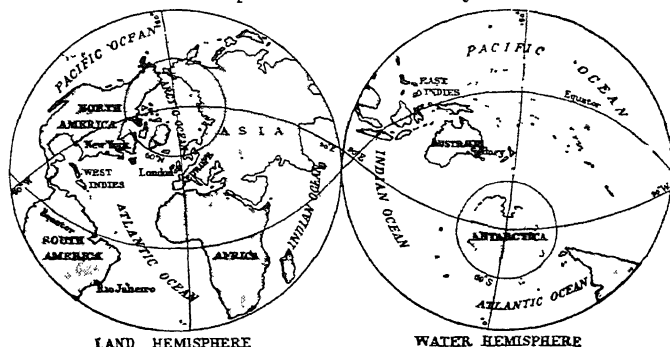
A. Hunter, Ph.D., F.R.S.

**Bibliography.** The Earth, H. Jeffreys, 1929; Earthquakes and Mountains, H. Jeffreys, 1935; Internal Constitution of the Earth, ed. B. Gutenberg, 1939; About This Earth, F. K. Ward, 1946.

**Earth.** In the electrical sense, this term refers to the use of the earth as a very large conductor and consequently as possessing a very large capacity. Its potential is regarded as invariable by virtue of the fact that any other conductor that may be connected to it will have a negligible capacity by comparison. On connecting a charged conductor to the earth, the transference of electrical charge involved will therefore make an inappreciable change in the total charge residing in the earth, and hence the potential of the latter has come to be regarded as the general standard of reference. (See Circuit).

When it is desired to shield an electrical apparatus from the inductive influence of external electrical charges, it is usual to enclose the apparatus in a metallic container which is electrically connected to earth. This is called electrostatic screening. In some electrical train systems only one insulated conductor rail is employed, the earth being utilised as the return conductor.

**Earth Colours.** Pigments universally employed before the introduction of oils. The cave men used red, yellow, black, and white for their crude but spirited drawings of animals, and the ancient Egyptians and Greeks resorted to similar though somewhat more numerous



**LAND HEMISPHERE**  
Earth. The world in hemispheres. The land hemisphere has its centre approximately at London. The Arctic basin is antipodal to the Antarctic continent; Africa is antipodal to the great basin of the Pacific. The water hemisphere includes Argentina, Australasia, the East Indies, and the south-east corner of Asia

periences summer, the rays of the sun falling more nearly vertically than six months later, when the S. hemisphere has its summer. At points a quarter of a revolution away (see Equinox) neither pole is tilted to the sun, and all places on the earth have 12 hours' day and 12 hours' night. Owing to the earth's elliptic orbit, the sun is 3 p.c. nearer to the earth in Dec. than in June; thus the N. winter tends to be warmer than the S., and the N. summer cooler than the S. At any given latitude, however, the climate is largely controlled by the neighbouring land or ocean masses, and the isotherms (q.v.) by no means follow parallels of latitude.

The universal force of gravitation causes all material objects to

below. This condition of gravitational compensation is called isostasy.

The earth acts as a giant magnet with its axis inclined to the axis of rotation by about  $17^\circ$ , the poles being not quite at the ends of a diameter. The N. magnetic pole was reached by Ross in 1831 and found to be at long.  $96^\circ 43'$  W., lat.  $73^\circ 31'$  N. Shackleton in 1909 found the S. magnetic pole at long.  $155^\circ 16'$  E., lat.  $72^\circ 25'$  S. The magnitude and direction of the magnetic field at any point are constantly changing, but roughly speaking the field is similar to that which would be produced by a short magnet at the earth's centre lying along the magnetic axis. The cause of the magnetic field is unknown.



pigments. Honey or one of the gums was probably the binding medium. The earth colours include the ochres, umbers, sienna brown, and terre verte.

**Earth Density.** This has been determined experimentally by several physicists, beginning with Cavendish. The mean density as calculated most recently by C. V. Boys is 5.5268; or rather more than five and a half times that of water. See Cavendish Experiment.

**Earthenware.** Name given to all pottery that is not translucent. It includes Faience, Delft, Stoneware, Granite-ware, Silicon, and Semi-porcelain. It may be glazed or unglazed, the terracotta of the Greeks, flooring tiles and building blocks, Majolica and enamelled wares all coming under the general term. Its origin is lost in antiquity, dating back to a primitive culture when plaited baskets were encased in clay for cooking food. See Pottery.

**Earth-House.** Primitive underground structure of the early metallic age, especially in Scotland. Normally it is a round or rectangular chamber of unhewn masonry, with a beehive roof, beneath an artificial mound. Frequently one or more chambers are approached by stone-lined, stone-paved corridors, often planned with a sharp bend, as at Tealing, Angus, where it is 80 ft. long, 5 ft. 8 ins. high, with cup-markings. On the moor of Clova, Aberdeenshire, about 50 of these so-called Picts' Houses lie within two sq. m. At Skerrebrea, Orkney, several groups of chambers—one 21 ft. by 11 ft.—were reached from a common corridor. At Cairn Conan, Arbroath, the underground chamber lay near surface foundations, pointing to its probable use for refuge and storage in connexion with surface dwellings. The cultural range of the associated remains—querns, spindle-whorls, horn and bronze implements, Samian ware—resembles that of the Broch. Similar structures occur in Ireland and Cornwall. See Archaeology; Underground Dwellings.

**Earthly Paradise.** THE. Poem or cycle of narrative poems by William Morris, published in four parts, 1868-70. The stories, chosen from classical and medieval sources, are supposed to be told by a miscellaneous group of 14th century story-tellers, banded together in search of that earthly paradise which gives its name to the whole. The first poem in the series, *The Life and Death of Jason*, was published as a separate volume, 1867.

**Earth Movement.** The crust of the earth is much less stable than might be expected. Throughout geological time it has been subjected to great forces, and in consequence deformed, elevated, and depressed. Mountain ranges have been raised, and large areas have been elevated, tilted, or lowered beneath the sea. The temple of Serapis, near Naples, has been lowered beneath sea-level and now stands once more above it. Precise levelling shows that England is being slowly tilted to the S.E.; the foundations of Roman buildings on the S.E. coast are now below sea-level, and ancient British settlements in the same area have been found buried beneath recent deposits.

In Scotland the presence of raised sea beaches at 100 ft., 50 ft., and 25 ft. indicates periodical rising of the land relative to the sea. Movements which result in the slow elevation or lowering of large areas of the land are referred to as epeirogenetic.

Earth movements caused by compressional forces acting on the earth's crust give rise to the formation of mountain ranges—*orogenic* movements. These begin by the development of a long zone of subsidence or down-warping of the crust. The slow sinking of this trough—*geosyncline*—is accompanied by deposition of sediments which may accumulate to great thicknesses (over 30,000 ft. in the Appalachians). When the crust beneath the geosyncline is unable further to withstand the stresses it buckles downwards, and the sediments in the trough are crushed together and thrust beyond its borders. The folded and contorted rocks are thus raised above sea-level, and a mountain range is heaved up along the line of the earlier zone of subsidence.

Tensional forces acting on the crust produce fractures known as faults; the great rift valley of E. Africa, Red Sea, Dead Sea, and the Jordan is the result of the breaking of the crust and the dropping of elongated tracts between parallel faults. Some ocean deeps probably have been similarly formed. Faulting accompanied by tilting has produced in many regions fault-block mountains. These have a steep face which is the plane of the fault, and a gently dipping reverse slope which is the result of tilting of the block.

The greatest hypothetical earth movement, that of continental drift, is a matter of controversy. Some geologists believe that the

Americas were once attached to the Europe-Africa mass, and have drifted W., slipping on a viscous substratum below the crust. Australia, Antarctica, and New Zealand are thought to have moved S. and E. from Africa. The theory simplifies many geological problems, but raises others.

**Earth-Nut Cake.** Artificial feeding stuff. It is prepared from the underground fruit of the leguminous plant variously known as earth-nut, ground-nut, monkey-nut, or pea-nut (*Arachis hypogaea*), after the oil has been extracted. In the decorticated form, which is better known than the undeckorticated, the husk has been removed, and it is then a good substitute for decorticated cotton-cake. Percentage composition: water, 10.43; oil, 8.17; albuminoids, 48.32; digestible carbohydrates, 22.99; fibre, 4.67; ash, 5.42.

**Earth Pillar.** Pillar of clay capped by stones. In an area consisting of clay or soft rock contain-



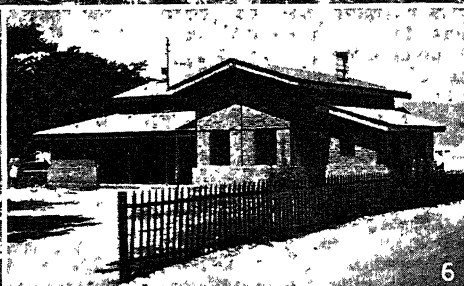
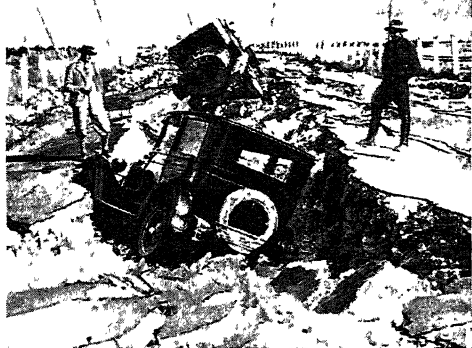
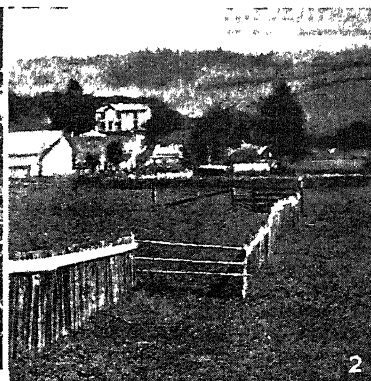
Earth Pillar. An example at Euseigne, Switzerland

ing large stones the softer materials will be readily washed away by the rains, but the stones, acting like umbrellas, will protect the clay or soft rock immediately beneath them. In this way pedestals capped by stones are formed.

**Earth Plate.** Metal plate, buried in the ground, to which a conductor is electrically connected if it is desired to maintain the conductor at the potential of the earth; the latter being assumed to have a zero value. See Circuit.

**Earthquake.** Vibration of the earth's surface resulting from some sudden movement in or below the crust. The study of earthquakes is known as seismology (*q.v.*), from Greek *seismos*, an earthquake. Most earthquakes are related to faults (*q.v.*) or earth-fractures lying near or within the margins of the more recently formed mountain chains of the world.

Seventy-nine p.c. of recorded earthquakes have occurred in one or other of two such great belts—the Circum-Pacific, *i.e.* the W. coast of the two Americas and W. Indies,



1. Vertical displacement of the surface, Mino-Owari, 1891. 2. Horizontal displacement of the surface shown by off-setting of fence, California, 1906. 3. Road in Napier, New Zealand, fissured by earthquake in 1931.

4. Ruined street in Gifu, Hondo, Japan. 5. Dak bungalow, Quetta, ruined, 1935. 6. Earthquake-proof bungalow, 1935, nearly opposite bungalow in No 5. 7 and 8. Desolation caused at Erzincan, Turkey, 1940

# **EARTHQUAKE: EXAMPLES OF EARTH MOVEMENT AND DAMAGE BY MODERN EARTHQUAKES**

1. From Great Earthquakes, C. Davison, Thomas Murby & Co., 2 and 3 From Earthquakes, J. Milne and A. W. Lee, Kegan Paul, Trench, Trubner & Co., 1939. 5 and 6 From Quetta Earthquake, Records of the Geological Survey of India, 1936, photographs by W. D. West

Alutian Isles, E. China and Japan, E. Indies and New Zealand; the Mediterranean-Himalayan belt, which extends from the Cape Verde Is., through Spain and Portugal, Italy and the Alps, the Balkans, Asia Minor, the various Himalayan ranges to Burma and China, where it joins the Circum-Pacific belt. Subsidiary zones are the Rift Valleys of E. Africa, and the Mid-Atlantic Swell, which runs from Iceland to approximately Ascension Is. Few earthquakes have been recorded from those roughly level stable regions that are built of ancient rocks. Earthquakes associated with earth movements are referred to as tectonic earthquakes; they are of much greater intensity than are volcanic earthquakes, which occur near active volcanoes.

#### Cause and Degree of Earthquakes

The earth's crust is being continually deformed by slow internal movements, many of which occur in recognized fault zones. As long as the movement is slow and continuous, it is felt only by delicate instruments; but if some resistance restrains this slow movement, stresses in the earth's crust pile up until they become stronger than the resistance. A sudden slip follows, and the vibrations set up cause an earthquake. The San Francisco earthquake in 1906 was caused by a sudden slip on the San Andreas fault. The horizontal shift in this case was in places over 20 ft. Fences, roads, and water courses were displaced laterally. At Yakutat Bay, Alaska, in 1899, sudden movement on a fault resulted in a local uplift of the seacoast of nearly 50 ft.

The slip does not take place over the whole length of the fault, which may measure hundreds of miles; it is distinctly localised. The point or zone of origin of an earthquake is called the focus. In normal earthquakes it lies at less than 30 m. below the surface, in intermediate earthquakes at between 30 and 150 m., and in deep-focus earthquakes down to about 450 m. The epicentre, where the maximum effect of the earthquake is felt on the ground surface, lies vertically above the focus. The intensity of the shock at different points on the ground can be estimated by the nature of the damage done to buildings, etc. This damage has been classified and standardised in two scales, the Rossi-Forel scale and the Mercalli scale. By plotting the damage according to its degree by one of these scales, zones of equal inten-

sity are mapped around the epicentre. Their boundaries are called isoseismal (*iso*, Gr. equal). They are roughly concentric around the epicentre.

The 12 degrees of Mercalli's Scale, modified by A. Holmes (1944), are: (1) instrumental: detected only by seismographs; (2) very feeble: noticed only by sensitive people; (3) slight: felt by people at rest; (4) moderate: felt by people in motion; (5) rather strong: people are awakened, bells ring; (6) strong: slight damage; (7) very strong: walls crack, alarm is general; (8) destructive: chimneys fall; (9) ruinous: some houses fall; (10) disastrous: many buildings destroyed; (11) very disastrous: few structures left standing, ground fissured; (12) catastrophic: total destruction, objects thrown into the air, ground badly twisted.

The instrument for recording vibrations from earthquakes is known as a seismograph. It is mounted on a heavy masonry pillar let into the ground at a point free from local vibrations from traffic, etc. A delicately suspended lever carrying a heavy weight, the inertia of which keeps the lever stationary when the instrument and its foundation respond to the vibrations, is connected with and keeps steady a rotating drum on which a pen or other device forming part of the instrument records any motion to which the ground has been subjected.

#### Determining the Epicentre

Different types of vibrations emanate from an earthquake: the fastest are longitudinal vibrations or P-waves, which vibrate in the direction in which they are travelling. Next are transverse, shake- or S-waves, which vibrate at right angles to the path along which they move. Thirdly there are long- or L-waves, which travel in the earth's crust only and are the slowest. The L-waves are the most damaging. The accurate timing of the arrival of the different types of waves at an observing station, together with the known speeds of these types, affords from the measured time intervals (e.g. "S" time minus "P" time) the means to calculate the distance of the station from the focus. When the distances from three suitably placed stations are known, the position of the epicentre can be determined. If there are three seismographs at one station, recording vertical earth movements as well as movements in each of the N.-S. and E.-W. directions, it

is possible to deduce the epicentre, independently, from a complete record of these three components. As a rule, however, only large earthquakes provide sufficient information to make it possible to locate the epicentre in this way, without reference to the records from other stations.

Earthquake waves are reflected and refracted at discontinuities, or surfaces of different types of rock-matter, inside the earth. From a study of the so-called travel-times of the waves, it is possible to draw important conclusions regarding the inaccessible internal layers and core of the earth. Geophysical prospectors (exploring e.g. for possible oilfields) deduce facts about local geological structure from the behaviour of the waves of artificial earthquakes generated by explosive charges.

#### Submarine Earthquakes

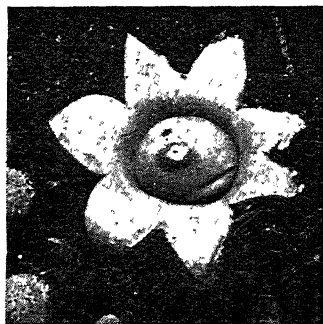
Near the epicentre of a disastrous earthquake, the ground heaves in moving waves comparable to sea-waves in appearance. They are naturally more obvious in alluvium, artificially filled ground, or recent unconsolidated sediments than in solid rock. They cause the ground to crack open, and sand-laden springs to gush out. Under-surface pipe-lines are broken, and extensive damage by fire due to burst gas-mains and broken electrical wires is added to that caused directly by the earthquake waves. In mountainous areas landslides occur, which may dam rivers or divert them. Submarine landslides of unconsolidated sediment off the coast are common. Submarine earthquakes often produce enormous sea-waves or *Tsunamis* (Jap). These are very destructive, as at Lisbon in 1755, and more recently in the Sanriku earthquake (Japan) in 1933. Here the waves reached a maximum height of 93 ft.

The design of buildings to withstand earthquake shocks has improved in the 20th century. Steel frame or reinforced concrete buildings are efficient, if kept below 100 ft. in height, with light roofs and upper structures. Buildings on deep foundations and massive concrete-raft foundations have also stood shocks well. See Earth Movement; Fault; Geology; Seismology. Consult also Earthquakes and Mountains, H. Jeffreys, 1935; Great Earthquakes, C. Davidson, 1936; Earthquakes, J. Milne and A. W. Lee, 1939, Principles of Geology, A. Holmes, 1944.

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**Earth-shine.** Illumination of the moon by reflected light from the earth. It can be observed with greater or less distinctness, according to locality and atmospheric conditions, when the portion of the moon illuminated by the sun appears only as a slender crescent. On account of irradiation (*q.v.*) the crescent appears slightly larger than the darker part of the disk, and the phenomenon is often described as "the old moon in the new moon's arms." In favourable conditions all lunar seas are conspicuously visible, as are also the other prominent features. Aristarchus and Copernicus appear as bright specks. Humboldt endorses an observation that this reflected light changes in colour according to the region of the earth from which it is reflected. *See Moon.*

**Earth-star** (*Geaster*). Genus of fungi, of the family Lycoperdaceae. They are distin-



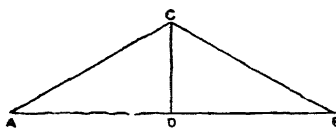
**Earth-star.** Specimen of the fungus showing its pointed segments

guished from the puff-balls (*Lycoperdon*) by the two outermost layers splitting from the apex into several pointed segments which expand and give the plant its stellate form. The numerous species grow upon the ground.

**Earthwork.** Ancient stronghold defended by earthen mounds. There are several thousands in England and Wales. Promontory forts, utilising natural defences, are either coastal or inland. They developed into cliff castles. Hill-forts are characteristic of neolithic Britain. Plateau forts are on flatter ground. When round or oval they are pre-Roman, but often were used successively by neolithic, Celtic, Roman, Saxon, and Norman occupants. There is a good earthen hill-fort on Midhill Head, Midlothian, but Scottish strongholds are mostly of stone. *See Caesar's Camp; Dyke; Rath.*

**Earthwork.** In engineering, the excavation and disposal of materials which can be loosened with-

out blasting. Railway engineers, when running their surveys, endeavour to fix formation levels which will balance excavation and embankment, preventing useless



**Earthwork.** Diagram illustrating angle of repose

dumping and too much borrowing from outside areas.

The cubic contents of a cutting or embankment relatively to its average depth is governed by the angle of repose of the material under the conditions to which it will be exposed when the work is completed. If dry sand is poured on to a horizontal surface A B (*see diagram*), it forms a conical pile, the slopes of which make an angle of about  $35^\circ$  with A B. As long as the heap remains dry, the angle is unchanged, and the heap is stable. Therefore angle C A B (= angle C B A) is the natural angle of repose. Addition of water reduces the friction between the particles, and the heap spreads out until a condition of equilibrium is re-established, the angle of repose being reduced to  $22^\circ$ - $26^\circ$ .

The angles of repose of other substances are approximately: damp clay,  $45^\circ$ ; wet clay,  $16^\circ$ ; earth deposited in layers and rammed,  $60^\circ$ - $70^\circ$ ; damp earth piled in bulk,  $45^\circ$ ; dry earth,  $30^\circ$ ; wet earth,  $16^\circ$ - $18^\circ$ ; gravel,  $45^\circ$ - $50^\circ$ . Assuming that proper provision is made for drainage, a slope in which A D : C D ::  $1\frac{1}{2}$  : 1 is safe for average earthwork in both cutting and embankment. To allow for the effect of heavy rain, it may be prudent to make the slope more gentle than this, as extra work done in the first instance is less expensive. The shoulders and toes of embankments should be rounded off, and the slopes covered with grass, which protects the earth against the loosening influence of rain.

#### Ditches and Drainage

If there be any likelihood of water flowing down into a cut from higher ground, a ditch is dug near the edge to intercept the water and carry it to a point where it can pass away without doing damage. In clay it is often necessary to cut Y-shaped ditches in the direction of the slope and fill them in with lump chalk, clinkers, etc. The arms of a Y catch the water, which flows down the leg into permanent drains along the foot.

For general excavation of earthwork on a large scale, caterpillar tractor-drawn scrapers are employed, with capacities up to 13 cu. yds. They are used for removing the material and depositing it on sites, and a haul of about  $\frac{1}{4}$  mile is the most economical distance. This machine has the great advantage in forming embankments that it deposits the material in thin layers of about 6 ins., and the constant traffic of the caterpillar tractors and the pneumatic tires effects a high degree of consolidation. For larger hauls the wheel tractor scraper is best employed; for really long hauls the shovel, with bucket capacities up to 35 cu. yds., loading into dumpers, gives the greatest advantage. The dumper can transport material over rough unmade ground, and has largely superseded light rlys. and tipping wagons. It is extremely mobile and can take a load measuring up to 9 cu. yds.

In trenches, earth and other soft material is generally excavated by machines consisting of an endless chain, carried on a boom, and fitted with specially shaped buckets. The angle of the boom is adjustable and regulates the depth of the cut. The buckets discharge on to a belt conveyor which carries the material away from the trench ready for back filling.

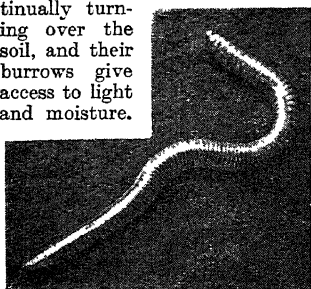
Railway embankments are generally formed by tipping over the end, and allowing the debris to find its own angle. Settlement of the material by consolidation must be allowed for to the extent of  $\frac{1}{12}$  to  $\frac{1}{8}$  of the height of the pile. If the earth be spread in layers, subsequent shrinkage is small. To open the road quickly it may prove economical to run a temporary trestle across a fill and dump earth from it to both sides. The stringers are removed as the earth reaches them, the uprights and cross-bracings are left in position and help to give solidity.

If the maximum density be required, as for the embankments of reservoirs and behind retaining walls, earth is spread in layers a few inches thick, and well rammed. *See Embankment; Engineering.*

**Earthworm.** Segmented worm living in the soil. Their rounded shape and the short bristles with which the segments are provided enable the worms to push their way through the soil and to form burrows. They eat their way also, and derive their food largely from the vegetable matter contained in the soil swallowed. When this has

been extracted, the soil, after being reduced to fine particles in the intestine, is discharged at the mouth of the burrow in the familiar worm-castings.

In his Formation of Vegetable Mould through the Action of Worms, 1881, Darwin estimates that in an acre of average garden land there are about 53,000 earthworms, and that every year about ten tons of soil pass through their bodies, with the result that they spread fresh soil on the surface at an average rate of an inch in five years. In this way they are continually turning over the soil, and their burrows give access to light and moisture.



Earthworm, a valuable agent in maintaining the fertility of the soil

The destruction of earthworms is therefore an economic mistake.

Although without eyes, earthworms dislike light and emerge from their burrows only after dark, unless flooded out by storms. Even when they have emerged, they usually keep the tail in the hole ready for instant withdrawal if alarmed. They are in the habit of plugging the mouth of the burrow with leaves or small stones; and vegetable matter is drawn in for future consumption. They can certainly smell and taste, and it is probable that they can appreciate the vibrations caused by sound. Earthworms are hermaphrodite, and impregnation is mutual in the union of the sexes. The eggs are deposited in a kind of horny cocoon, which is formed by a secretion round the swollen ring which may be noticed on the body of an adult and is often mistaken for the scar of an old injury.

**Earwig.** Name given to members of the order Dermaptera (Gr. *derma*, skin; *pteron*, wing). Their fore wings are reduced to leathery flaps covering the large, complexly folded hind wings. The body ends in callipers, curved in the male and straight in the female. The female shows parental care for her eggs and young offspring. The common earwig (*Forficula auricularia*) eats both animal and vegetable food and is often injurious to tender

plants. It can be trapped in tightly rolled corrugated paper placed upright near its haunts.

**Easby Abbey.** Ruin in the North Riding of Yorkshire, England, 1 m. S.E. of Richmond, beside the river Swale. It was founded in 1152 by Premonstratensian canons and dedicated to S. Agatha. Later it passed into the possession of the Scrope family, and its decay dates from the dissolution of the monasteries under Henry VIII. The church is set in the centre, with domestic buildings N. and S.; the refectory, chapterhouse, gatehouse, and infirmary are among the most interesting remaining portions.

**Easel Picture.** Term applied in art criticism to a picture painted without reference to its eventual position or surroundings, dealing with any subject the artist prefers, for exhibition anywhere or for possible sale, in a frame, to any patron willing to buy. The term is thus used in contradistinction to a painting intended as a decorative adjunct to a particular architectural setting or fitting, e.g. a mural painting, or a painting for an altarpiece. The Dutch School (*q.v.*) of the 17th century was the first to devote itself almost exclusively to the painting of easel pictures.

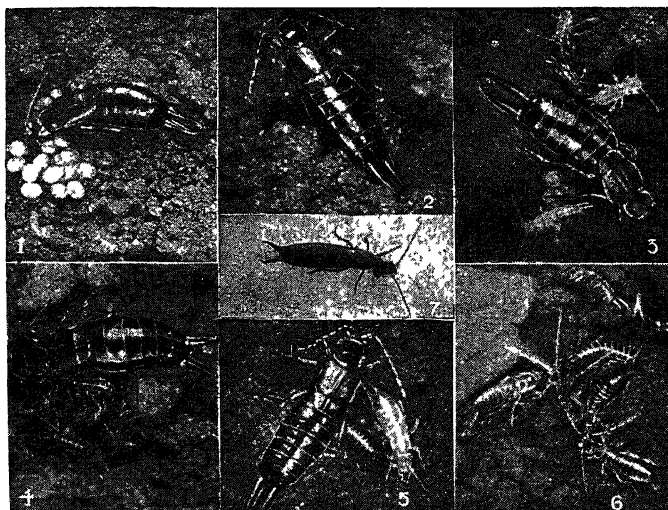
**Easement.** Term used in English law for what is called servitude in Scots law and in other legal systems. There must be two pieces of land (tenements), and the owner of the one, called the dominant tene-



Easby Abbey, Yorks. Guest House, part of the remains of this 12th century religious foundation

ment, has a right over the other, servient tenement. Thus, the owners of Whiteacre (dominant) have a right to use a footpath which runs across Blackacre (servient); this is called a right of way. Other common easements are right of light, or the right to prevent obstruction to windows; drainage; support for buildings—e.g. where one house leans on another.

If the dominant and servient tenements come into the same ownership, the easement vanishes, and if the ownership is again divided a fresh grant of easement is required. Easements are acquired by grant from the servient owner to the dominant owner; but a grant will be implied where a grant



**Earwig.** Stages of life history. 1. Female earwig rearranging her eggs in the soil. 2. Assisting the hatching-out process. 3. The young earwigs, silvery at first, emerge after 15 days. 4. The family now increased to 48. 5. As they grow, the young earwigs moult to silvery white again. 6. Starting life at a month old. 7. Earwig, natural size. Figs. 1 to 6 are enlarged two diameters

of land would be useless without an easement—*e.g.* if A grants to B a field in the middle of A's land, and there is no public road to the field, there is an implied grant of a right of way over A's land. Easements are also acquired by long usage. See Prescription.

**East.** One of the cardinal points of the compass, and the quarter of the horizon where the sun rises when in the equinoctial. When the observer faces north the east is on the right hand. From ancient times the east has had religious significance, and devotees of most pagan religions built their altars in the eastern part of the temples, so that they could offer sacrifice towards the rising sun (see Eastward Position). The custom of praying towards the east was adopted by the Christian church in the 2nd century, as was the practice of burying the dead with their feet to the east; this was because of the tradition that Christ was placed in the tomb with His feet towards the east, and that at the day of judgement He would come from the eastward in the heavens.

As a noun, East is used for Asia and the eastern part of the world generally, and the terms Near East, Middle East, and Far East are employed as somewhat vague political and geographical subdivisions. The Near East may be said to include Egypt, Palestine, Turkey, Syria; the Middle East, India, Afghanistan, Arabia, Persia, Iraq; and the Far East, China, Siberia, Japan, Manchuria, Siam, Indo-China, and Indonesia.

**East, SIR ALFRED (1849–1913).** British painter and etcher. Born at Kettering, Dec. 15, 1849, he became a landscape painter of pronounced individuality, though with a strong sympathy with Corot. A.R.A. 1899, and R.A. 1913, he was knighted 1910, and died Sept. 28, 1913. Well represented in municipal galleries, he left to Kettering a collection of his works, opened 1913. His etchings are well remembered.

**East Africa, BRITISH.** The possessions included under this heading are described under their individual names: Kenya; Somaliland, British; Tanganyika; Uganda; Zanzibar.

**East Africa, GERMAN.** Former German colony now known as Tanganyika Territory (*q.v.*). The scene of much fighting in the First Great War, it was surrendered to Allied forces in 1918, and administered by Great Britain under League of Nations mandate 1920–46, then under U.N. trusteeship.



German East Africa. Map to illustrate the campaign in the First Great War, which ended in the conquest of the German colony in East Africa

At the outbreak of war on Aug. 4, 1914, German East Africa was garrisoned by a small but well trained and equipped native army with a leavening of 250 white troops. The German commander, Lt.-Col. von Lettow-Vorbeck, was an able soldier who enjoyed the unswerving loyalty of his troops, but his initial advantages were hampered by the timidity of the civil governor of the colony, von Schnee. British troops in East Africa were inadequate for large-scale operations, although on Aug. 13 a British cruiser bombarded Dar-es-Salaam and rendered the port temporarily untenable.

On land there were attacks by both sides on frontier posts and several places were captured and recaptured. The British eventually managed to isolate the colony, but as the Germans had ample supplies and were able to avoid being drawn into any decisive battle, the campaign in East Africa served only to tie down numbers of British troops. Thus matters stood in Feb., 1916, when Gen. Smuts (*q.v.*) arrived at Mombasa to take command in East Africa. Reinforcements had also been sent out, and soon he had some 30,000 men. The Belgians were also preparing to take part in the campaign.

Early in March the British opened a general offensive against Tanganyika by advancing through the Kilima-Njaro pass, but the main body of the enemy was able to retreat intact. The following month the British offensive was

The Germans put up a succession of rearguard fights and always managed to extricate their main army, but their territory was gradually shrinking and by the end of 1916 they were compelled to concentrate their force between the Rufiji river and Portuguese territory. The British reached Kibambawe on Jan. 5 1917, and after some months of hard marching and jungle fighting crossed the Rufiji on June 5. The Germans, in two main bodies, put up a bitter and prolonged resistance. On Nov. 28 one of their main bodies surrendered, and shortly afterwards the forces under von Lettow-Vorbeck crossed into Portuguese territory, finally surrendering on Nov. 14, 1918. The campaign cost nearly 20,000 British casualties. Consult *Three Years of War in East Africa*, A. Buchanan, 1919; *My Reminiscences of East Africa*, P. von Lettow-Vorbeck, 1920.

**East Africa, ITALIAN.** Former Italian colonies of Eritrea, Somaliland, and Abyssinia. Eritrea (*q.v.*) was formed in 1890 from a number of Italian possessions on the Red Sea. The inland boundaries of Italian Somaliland (*q.v.*) were settled by treaty with Abyssinia in 1908, and in 1925 Italy acquired from Great Britain the territories on the S. and W. bank of the Juba river. Abyssinia (*q.v.*) was annexed after conquest in 1936. Eritrea and Somaliland were occupied by the British in 1941 and Abyssinia was liberated the same year. See East Africa Campaign.

renewed with three divisions based on Moshi, while Belgian forces entered the colony from the W. In rapid succession Kondoa Irangi, Wilhelmstal, and Handeni were captured. The seizure of the rly. to Tanga made the British hold on the N.W. part of the colony secure. Tanga itself was captured on July 7, Mwanza on July 12, Dodoma on July 30. The British were then in control of a large section of the rly. from Dar-es-Salaam to Ujiji. Dar-es-Salaam fell on Sept. 4.



## EAST AFRICA CAMPAIGN: 1940-41

Irene Clephane, Associate Editor, Second Great War

*From this account of the conquest of Italy's East African Empire by British forces, it will be seen that the vital part of the campaign lasted only four months—from the end of Jan. to the beginning of June, 1941. For the relationship of this campaign to the war as a whole, see Second Great War*

When Italy declared war on France and Great Britain on June 10, 1940, she had in E. Africa a well trained and well equipped army estimated at over 200,000 men as well as another 200,000 in Libya; British forces in Egypt, the Sudan, Kenya, Palestine, and Aden totalled 85,000.

The British immediately began to make lightning raids over the frontier of Abyssinia from British Somaliland, Kenya, and the Anglo-Egyptian Sudan. At first they met with little resistance. By the end of June, however, the Italians were showing more fight: on July 4 they captured Kassala, on the 6th Gallabat, on the 7th Kurmuk, all in the Sudan; on July 15 the British garrison was forced to withdraw from Moyale (Kenya). At the beginning of August, the Italians invaded British Somaliland from Abyssinia in three columns, occupying Hargeisa and Zeila on the 5th, Oadweina on the 6th. Though greatly outnumbered, the British at first successfully resisted an enemy attack on the Tug Argan gap, between Hargeisa and Berbera, the capital. But the Italians made rapid progress towards Berbera along the coast from Zeila; and, deprived by the terms of the Italo-French armistice of the assistance of the French forces assembled in French Somaliland, the British had not strength to stem the enemy advance when the Italians brought up reinforcements. On Aug. 19 they evacuated the country, which was occupied by the enemy. The British force reached Aden safely with the bulk of its equipment and material.

### Patriot Forces Organized

British and South African air forces based in the Sudan, in Kenya, and, at first, in British Somaliland, carried out a number of bombing attacks on the E. African towns in which the Italians were most strongly established—Agordat, Asmara, and Massawa in Eritrea, Dire Dawa, Dessie, Addis Ababa, and Harar in Abyssinia, Kismayu and Mogadishu in Italian Somaliland. Skirmishes on the Abyssinian-Sudan and Abyssinian-Kenya frontiers continued, with varying

success on either side, and successful attacks were made on Italian convoys by Abyssinian guerrilla bands in the district of Gojjam, which the Italians had never entirely subdued. Resistance in this storm centre was gradually organized under conditions of great secrecy by a British mission (consisting of Col. D. A. Sandford, two other officers, and three n.c.o.s, all acquainted with the country, its customs, and its languages) which reached the area in Aug., 1940, though its presence was not admitted until Jan., 1941, following the announcement that patriot Abyssinian forces, assisted by the Royal Air Force, had compelled the Italians to evacuate Qubba.

### Abyssinian Guerrillas Armed

The mission was accompanied by a representative of the emperor, Haile Selassie, who himself arrived in the Sudan from England towards the end of July, 1940, where he immediately became the rallying point for all Abyssinians in exile and for many who crossed the frontier from Abyssinia itself. Some 1,000 rifles were presented to the patriot leaders, and other convoys of arms, carried on camels and mules and escorted by Abyssinian troops from the Sudan, followed. In Nov., Maj. O. C. Wingate was appointed to take charge of operations. The Italians failed to locate the mission, which lived in caves and under cover of the woods. The emperor himself, the crown prince, and the duke of Harar, entered Abyssinia on Jan. 20, 1941. This was the signal for revolt in Gojjam, and within a few days, without any definite action, a large part of the country between the Blue Nile and the river Seti was, except for isolated Italian garrisons, in Abyssinian hands.

Farther north, Gallabat was recaptured in Nov., 1940, Kassala on Jan. 19, 1941, by British forces, under the command of Lieut.-Gen. Sir William Platt. The Italians evacuated not only Kassala but strongly defended positions about it, withdrawing into Eritrea closely followed by the British, who occupied Sabdaret and Tessenei on the 20th, Aicota

on the 21st, forced the Keru Gorge on the 23rd, and reached Biskia on the 26th. The important railway junction of Agordat fell on Feb. 1, with the capture of hundreds of prisoners, many guns, and much mechanical transport. Barentu was captured on Feb. 2. On the coastal road, another force advancing from Suakin took Karora on Feb. 9, Mersa Taklai on the 10th, Kub-Kub on the 24th. Keren, after a difficult assault and strong defence, was stormed on March 27. The loss of Keren, a natural stronghold of great strength, broke the morale of the Italians in Eritrea, and British armoured forces followed the retreating enemy as fast as wheels could take them to Asmara, the capital, which was occupied on April 1. With the capitulation of Massawa on the Red Sea on April 8, Italian resistance in E. Africa outside Abyssinia ended.

The situation in Abyssinia had by that time changed considerably. With the cooperation of British and Imperial forces, particularly in the air, the patriot Abyssinians rapidly extended their sphere of control in Gojjam. On Feb. 16 the Italians abandoned Dangila, a large town which they had made into a garrison and air base, and other important posts. Enjabara, 18 miles away, and Piccolo Abbai, both evacuated by the Italians, were occupied, and the revolt swept on across the uplands of Gojjam, driving nearer and nearer to the main Italian base at Addis Ababa, which was constantly raided from the air. So also was Gondar, the base on which the Italian forces in the north had begun to retire, pursued by patriot and British troops.

### Italian Retreat in Abyssinia

By March 5 the patriot forces had occupied Burye and were pressing on towards Debra Markos. By the end of the month all effective resistance between Lake Tana and Lake Rudolf had been broken, and the Italians, both soldiers and settlers, driven much less by fear of the British than of the Abyssinians, were retreating on Dessie, Jiran (Jimma), and Addis Ababa. The Abyssinian flag was raised in Debra Markos on April 3, the emperor entering the citadel on the 6th. In six weeks some 1,600 Sudanese and Abyssinian troops, led by British officers, and with four 3-inch mortars, had cleared Gojjam of 10 colonial battalions, two Banda groups, four Blackshirt divisions.

In the meantime, British and Imperial forces had reoccupied Kurmuk (Feb. 12), captured Afodu, 45 miles inside Abyssinia from Kurmuk, and Asosa, near the Sudan border, and were also advancing from both Italian and British Somaliland.

There had been a gap of some 100 miles between the British and Italian forces along the Kenya-Italian Somaliland frontier from July to Dec. 1940, when the British, under Lieut.-Gen. Sir Alan Cunningham, opened an offensive. Composed of troops from S., W., and E. Africa, General Cunningham's force delivered its first attack on Dec. 16, against El Wak, a frontier post in the bush. After its capture the invasion of Italian Somaliland was prepared and organized from points far to the south. First a number of frontier posts on the Kenya border were

subdued, and then the Imperial forces swept on 100 miles from the frontier, to Afmadu, from which the Italians withdrew on Feb. 10, 1941, rather than wait for the British attack, delivered next day. Kismayu at the mouth of the Juba river was taken Feb. 14, the enemy having withdrawn.

The Royal Navy harassed the Italians moving along the road between Kismayu and Mogadishu, the capital, and on Feb. 25 Mogadishu itself was entered. The Italians surrendered in thousands, and only a small remnant endeavoured to escape along the road to Harar and Addis Ababa, pursued by the British who, crossing the Abyssinian frontier on March 6, advanced at an average rate of 65 m. a day. All the way to Harar there is a good metalled road, and the Italians offered no resistance—in fact, all

contact with the enemy was lost except through air reconnaissance. Jijiga was occupied on March 17, Harar on the 25th. Dire Dawa, evacuated by the Italians, was occupied on the 29th by S. African troops, who, arriving to find armed deserters from the Italian colonial infantry murdering Italian civilians, restored order.

Renewed operations in British Somaliland began when, on March 15, a little fleet of British warships and troop-carriers steamed towards the coast. Two landings were made, and naval guns bombarded Berbera, which was captured on March 16. A small column of Nigerians occupied Tug Wajale on the border on March 20, and two armoured cars, motoring through Hargeisa, established contact with the forces at Berbera. By March 24 British Somaliland was once more completely under British control.

By the end of March half Abyssinia had been conquered, and only three considerable towns remained in Italian hands. But the campaign was by no means at an end. Following heavy air raids on Addis Ababa aerodrome on April 4-5, Addis Ababa was entered on the 6th, and a comparative handful of Imperial troops, mostly S. Africans, disarmed 5,000 prisoners, of whom 4,000 were Italians. (On May 5—five years exactly since Italian troops entered the city—the emperor returned to his capital.) Fighting hard all the time, the Italians retreated on Dessie, which was captured on April 26 in the fiercest battle of the campaign: over 8,000 prisoners were taken. The Italian viceroy, the duke of Aosta, who had moved to Dessie on the fall of Addis Ababa, flew on to Amba Alagi, which at once became the target of growing attacks from the air.

The mountain of Amba Alagi rises to over 10,000 ft. Its caves, in which Haile Selassie had taken shelter five years earlier, became the last refuge of the Italian viceroy and his army. There were three ways of attacking the position, a naturally strong one reinforced by gun-emplacements cut out of the rock and other fortifications: by the Falaga Pass to the east, by the direct road, and along the ridge to the west. The last, the least apparently suitable and therefore least strongly defended, approach was chosen for the real attack, and while Indian troops advanced by the first two lines, the S. Africans,



East Africa Campaign, 1940-41. Showing the direction of British and Imperial attacks, which led to the conquest of Italy's E. African Empire

pressing on from the south, attacked on the west. The country through which the British forces were advancing was wildly mountainous, with deep gorges and towering peaks, where the enemy fought desperate delaying actions, destroying and obstructing the roads as they retired. But Indian sappers and miners did notable work in clearing them. By May 15 Amba Alagi was surrounded, and on the 16th it surrendered. The prisoners taken numbered 18,000, and included the duke of Aosta, with five generals and a number of other senior staff officers.

The Italian c.-in.-c. had surrendered, but fighting continued. One place after another fell into Allied hands, until Debra Tabor, cut off in mid-June, surrendered on July 3, 2,400 Italians and 2,000 Africans being taken prisoner. The Italian forces—some 40,000—still operating in Galla Sidamo surrendered next day. All Italian resistance in Abyssinia had collapsed, except at Gondar, on a plateau about 6,800 ft. high, where a force under General Nasi, estimated at between 10,000 and 15,000, still lay. Gondar was completely cut off from the rest of the country, not only by the British investment but also by the destruction of the three main roads by which the district could be reached. The area, however, produces a fair amount of food-stuffs, which reduced the possibility of starving out the garrison, and General Nasi held on through the summer and autumn.

Heavy rains made movement difficult, and operations were restricted to pressure by patrols of British, Imperial, and Abyssinian troops and to bombing from the air until weather conditions improved towards the end of Sept., and the British offensive was resumed. Wolcheft, a mountain pass of strategic importance north of Gondar, besieged since April 15, surrendered on Sept. 28. Patriot forces under British officers fought a number of successful minor actions in the Lake Tana area, and in the north established themselves between Wolcheft and Gondar. Low-level bombing attacks were made on Ambazzo 10 miles north of Gondar, on Oct. 21, and a day or two later British forces made contact with the Italians there, encountering strong opposition. Fighting took place on the Gondar-Asmara and Dessie-Gondar roads on Oct. 26.

Gradually the chieftains came in to the emperor, until at the

beginning of November only three in the Kamant area were still supporting the Italians. Kulkaber, an isolated enemy fort east of Lake Tana, surrendered on Nov. 21 and left the way open for an attack on the main defences of Gondar, 10 miles to the south. Civilian refugees from Gondar began to come into the British lines in a steady stream, and deserters, whose numbers increased daily, reported that outside Gondar there had been a mutiny of colonial troops, which had been suppressed only after severe fighting.

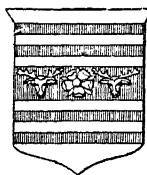
Allied and Abyssinian troops were now advancing on Gondar from six directions, and on Nov. 27 the garrison surrendered unconditionally to a combined infantry attack by African troops drawn mainly from E. Africa, with a proportion from W. Africa and the Sudan. The 1st battalion the Argyll and Sutherland Highlanders were the only non-Africans engaged. Prisoners taken numbered 11,500 Italians and 12,000 native troops. British aircraft dropped leaflets on the remaining Italian outposts telling of General Nasi's surrender, and all outlying garrisons surrendered on Dec. 2, 1941. Italian rule in E. Africa was at an end.

**East Anglia.** One of the kingdoms into which England was divided from the 6th to the 9th century. It embraced the present counties of Norfolk and Suffolk, and the name suggests that its founders were Angles. The first East Anglian king about whom anything definite is known is Raedwald, who died about 620. His successors were in turn the vassals of Northumbria, Mercia, and Wessex, until the Danes invaded their land and killed their king Edmund in 870. In the 10th century also

there were East Anglian kings, but they were only underlings of the English kings, as were the later earls. Today East Anglia is used loosely to describe the district between the Wash and the Nore.

**East Bengal.** Province of Pakistan. See Bengal.

**Eastbourne.** Co. bor., parl. div. and seaside resort, Sussex, England. It stands on the English Channel, bounded by Beachy Head, 3 m. S.W., and is 65 m. S.S.E. of London by electric rly. Formerly a village 1 m inland with scattered



Eastbourne arms

hamlets along the coast, the modern town was developed during the 1870s and is a fine example of street planning, the residential districts of Meads and Upperton containing wide tree-lined avenues. Much of the ground belongs to the duke of Devonshire. There are almost 3 m. of promenades, triple-terraced in parts, with Grand Parade forming the central portion. There are a pier and pavilion, three theatres, three golf courses, bathing, boating, and fishing facilities, and ample provision for tennis, croquet, etc. County cricket is played at The Saffrons in Aug. Other open spaces are Devonshire Park with its theatre, winter garden, pavilion, and baths; Gildridge, Hampden, and Prince's parks. During the season Eastbourne receives about 100,000 visitors and there are many hotels, the largest of which is the Grand.

The most famous residence is Compton Place, an 18th century mansion belonging to the duke of Devonshire which has been occupied by George V and Queen



Eastbourne. Sea front of this favourite holiday resort on the Sussex coast which also has a large residential population

Mary, George VI, Queen Elizabeth, and their daughters. The chief church is S. Mary's, the old parish church of the village of East Bourne (now known as Old Town). The other churches are modern, the largest being S. Saviour's. The principal school is Eastbourne College. The Lamb Inn was a medieval house of refuge. The Manor House has an art gallery and gardens. Carpet-gardens are famous. To the E. of the town stretches a shingly waste known as The Crumbles, from which point the coastline is diversified by martello towers. During the Second Great War Eastbourne suffered severely from German tip-and-run air attacks. In nearly 100 attacks, 800 H.E. bombs and 4,000 incendiaries were dropped; among buildings demolished was the technical institute. Pop. est. 42,210.

**Eastcheap.** London street extending from Gracechurch Street and Fish Street Hill to Great Tower Street, E.C. Owing its name to a butchers' market held here as early as the time of King John, and later removed to Leadenhall, the thoroughfare has varied in both length and name, but was known as Eastcheap from about the time of Henry III to the 16th century. About 1831 the W. end disappeared as did the church of S. Michael's, Crooked Lane, in the London Bridge improvements, and the E. end became known as Eastcheap and Little Tower Street. When the street was widened in 1884 the old name was restored for the whole of it. The site of the Boar's Head Tavern, Eastcheap, mentioned by Shakespeare, was approximately at the junction of King William Street and Gracechurch Street.

**East Chicago.** City of Indiana U.S.A., in Lake co., on the S.W. shore of Lake Michigan and Indiana Harbour, 20 m. S.E. of Chicago. One of the major Great Lakes ports, its facilities have been enhanced by the Indiana Harbour Canal, which extends S. to the Grand Calumet river and E. to Lake George. It ships petrol and finished steel, and receives cargoes of iron ore, coal, limestone, and other raw materials. It specialises in heavy industry, its plants including foundries, oil and metal refineries, rly. shops, and cement works. Settled in 1885, it was incorporated 1893. Pop. 54,637.

**Eastchurch.** Village of Kent. On the Isle of Sheppey, it is 5 m. E.S.E. of Queenborough and is served by railway. At an aerodrome here, in 1913, some of the earliest experiments in the drop-

ping of bombs from aircraft were carried out. During the battle of Britain the airfield was one of the stations of II Fighter Group and later became a training centre for R.A.F. and Fleet Air Arm personnel. It was one of the control points of A.A. defence in the flying bomb attacks in 1944. Pop. 1,500.

**Easter.** English name for the eccles. festival commemorative of the Resurrection of Jesus Christ. The feast, the most important in the Christian year, known as *Ostern* in Germany, in other countries is called by modifications of the Greek and Latin *Pascha*, which derives from the Aramaic *Pischa* and Hebrew *Pesach*=Passover, the name of the Jewish festival which coincided with the Crucifixion. Thus we have in Welsh *Pasg*, Italian *Pasqua*, Spanish *Pascus*, and French *Pâques*. The sacrifice of Christ, typified by the paschal lamb slain at the Passover, was celebrated as well as His Resurrection; there was a Pasch of the Cross as well as a Pasch of the Resurrection.

Celebrated generally in Christendom since the 2nd century, though for varying periods, Easter is a movable feast, and its occurrence governs the dates of the preceding Lent and the festivals following it. It was long observed as a special time for baptism, for the reconciliation of penitents and the release of prisoners, for the distribution of alms and for offerings to the clergy. Both the Roman Catholic and Anglican churches expect their members to receive holy communion at Easter, and have special services for Sunday, Monday, and Tuesday. Many special ceremonies also pertain to the celebration of Easter in the Roman Catholic Church. British Nonconformists, who in the 17th century formally repudiated the keeping of this festival, now commonly observe it. A number of pagan customs associated with the vernal equinox survived at Easter until the Middle Ages, and others were adopted by the Christian Church. In regard to the giving of Easter or pasch eggs, the idea that the egg symbolises resurrection is of a comparatively modern origin. Eggs, having been forbidden as food during Lent, were restored at Easter.

The secular importance of Easter is that it governs law, university, and school terms and business arrangements generally. Since the 8th century in Western Christendom, Easter Day has been celebrated on the first Sunday after

the first full moon, or after the 14th day of the moon, following March 21. Thus it cannot fall before March 22 nor after April 25. Neither of the extreme dates will occur again in the 20th century.

In 1928 an Act was passed in Great Britain providing that Easter Day should be the Sunday after the second Sat. in April to come into force on a date to be fixed by Order in Council. Twenty years later no date had been fixed.

Both the origin of the word Easter and the time of its observance have been subjects of controversy. Following the Venerable Bede, the derivation of Easter from *Eastre* or *Eostre*, the name of a Teutonic goddess of spring, has been commonly accepted. The dispute in the early Church as to the date of Easter was between the Christians of Asia Minor, who were called Quartodecimans because they kept the Resurrection on the third day after the 14th of the Jewish month Nisan, on whatever day of the week it fell; and the Western Church, which kept Easter on the Lord's Day following the 14th. The latter prevailed at the Council of Nicaea, 325. As the reform of the calendar in 1582 was not accepted in the East, the Eastern Churches still keep Easter on a different date from the Western. See Calendar; Metonic Cycle; Passover.

**Easter Island or Rapanui.** Lonely volcanic islet of the S. Pacific. It is 2,300 m. W. of Chile, to whom it belongs. Area about 50 sq. m.; alt. 1,970 ft.; lat. 27° 7' S.; long. 109° 20' W. It was discovered on Easter Day, 1722, by the Dutch admiral, Roggeveen, although its discovery is claimed for Davis, the buccaneer, in 1686. The few inhabitants are of Polynesian descent; Cook, visiting it in 1774, reported them as having the lobes of their ears extended almost to their shoulders. But its chief interest lies in some 500 ancient statues or torsos, stone huts and sculptural rocks, with pictographs (undeciphered) and Megalithic remains. Most of the carved faces are very high, one measuring 37 ft. Examples of these sculptures are to be seen at the British Museum. Attempts at deciphering some incised wooden tablets, called hyloglyphs, have not been altogether successful. The island is now a Chilean convict station. During the First Great War it came into notice in connexion with the commerce-destroying raids of the German auxiliary cruiser Prinz Eitel

Friedrich, which towed some of her captures to the island and there sank them. The crews of certain ships taken by the cruiser were left on the island., Dec 1914-Jan., 1915 *Consult Te Pito Te Henua or Easter Island*, W. J. Thomson, 1891; *The Mystery of Easter Island*, K. Routledge 1919



Easter I. land. Some of the mysterious stone statues on the island. Top, two "emaciated ancestor" figures about 2 ft. high, carved in mimosa wood  
P H Edmunds & British Museum

### Eastern Bengal and Assam.

Former province of India. On Oct. 16, 1905, it was constituted from the territories formerly administered by the chief commissioner of Assam, together with the Bengal divisions of Dacca and Chittagong, and the districts of Jalpaiguri, Dinajpur, Rangpur, Malda, Bogra, Rajshahi, and Pabna. The capital was Dacca. This partition was revoked in 1911, when George V announced at the Delhi durbar the reconstruction of Bengal with the presidency of Bengal, the lieutenant-governorship of Bihar and Orissa, and the chief commissionership of Assam. The new division of territory came into force April 1, 1912.

**Eastern Question.** Series of political problems arising in the 19th and early 20th centuries from the disintegration of the Ottoman empire. Russia, always desiring an untrammelled outlet to warm waters, aimed at securing the Dardanelles, while Britain (fearful for the Suez Canal and her imperial routes) and France (covetous of N. Africa and the Levant) supported the "sick man of Europe" against her. Turkey's Balkan provinces fought for independence; Austria tried to extend her borders to S. and E.; Italy wished to gain strategic buffers in Istria and Albania against Austria. Events arising from this maelstrom of con-

flicting policies were, in their chronological order, the war of Greek independence, the autonomy of Serbia and Egypt, the Crimean War, the formation of the Rumanian and, by the congress of Berlin, the Bulgarian kingdom, Austria's annexation of Bosnia-Herzegovina, and the Balkan wars of 1912-13 which, with the Serajevo murders of 1914, led directly into the First Great War, Germany seizing the opportunity to throw the Old World into chaos. The defeat of Turkey, Russia, and Austria in this conflict, and the rise of Kemal Atatürk's new Turkey after it, removed the prime factors in the Eastern Question. *Consult The Eastern Question*, J. A. R. Marriott, 1917.

### Eastern Siberian Region.

Territorial division of R.S.F.S.R. It is bounded by Krasnoyarsk to N.W., Yakutsk A.S.S.R. to N.E., Outer Mongolia to S., and surrounds the Buriat-Mongol republic. Irkutsk is the capital. Area 1,227,248 sq. m. Pop. 2,568,400. *See Siberia.*

**East Grinstead.** Urb. dist., parl. div., and market tn. of Sussex, England, lying 30 m. by rly. S.



East Grinstead. Picturesque buildings in the High Street of this small Sussex market town

of London. Its high street has Tudor timbered houses; Sackville College is a Jacobean almshouse dating from 1608. Bricks and tiles are made locally. Here is a hospital famous for plastic surgery operations. A German bomb fell in the centre of the town on July 9, 1943. Market day, Thurs. Pop. 7,902.

**East Ham.** Co. and parl. bor. of Essex, England. A populous district 6 m. E. of London, it has stations on two railway lines, and is served by London Transport vehicles. Residents work mainly at the docks and in factories, industries include engineering and the making of chemicals and soap, and the borough contains part of the Beckton gasworks, largest in the world. S. Mary Magdalene is the old parish church. East Ham was made a municipality in 1904 and a co. bor. in 1914. Two members are returned to parliament. Heavy air attacks in the Second Great War killed over 500 people and demolished 2,000 houses. Pop. est. 100,100.

**East India Company.** Name of a trading corporation, authorised by government to trade in the E. Indies. The Dutch company, 1602-1798, the French company, 1664-1794, and the Danish company, 1729-1801, followed the setting up of the English company, which survived them all. On Dec. 31, 1600, a charter was granted by Queen Elizabeth to "The company of Merchants of London trading to the East Indies." The establishment of three factories or trading-stations was sanctioned: at Surat, on the W. Coast, by the Mogul Jehangir in 1612; at Fort St. George, afterwards Madras, on the S.E. coast, by another native prince in 1639; at Hooghli, on the Ganges delta, 50 years later moved a little lower down the river to Calcutta, by Shah Jehan in 1640.

In 1661 the Portuguese gave Bombay to Charles II as part of the dowry of his bride; he conveyed it to the company, and it took the place of Surat as the western emporium. The three factories at Bombay, Madras, and Calcutta became the nuclei of the three presidencies.

The company was exclusively a trading concern. It had much difficulty in suppressing the embarrassing rivalry of independent traders called "Interlopers," who ignored its exclusive charter. In the reign of William III a rival company was actually sanctioned and started, but in 1701 the two were amalgamated as the Honourable East India Company. In 1746 Duplex.

the governor of the rival French company, attempted to oust the British and establish a French political ascendancy with the native princes. He was frustrated by Clive, with the general result that in 1765 the trading company had become the official administrators of the great province of Bengal, while sundry of the great princes were virtually their dependents.

The home government now became alive to a responsibility for the dominions acquired by the company; the unsuccessful experiment of Lord North's Regulating Act was followed by Pitt's India Act in 1784, which instituted the dual control shared between the company itself and a board of control appointed by a committee responsible to parliament. After the Mutiny of 1857 the government of India was transferred to the crown, and the East India Company was abolished by the India Act of 1858. *See* India.

**Bibliography.** *Annals of the East India Company, 1600-1708*, J. Bruce, 1810; *The Trade of the East India Company from 1709 to 1813*, F. P. Robinson, 1912; *East India Company, 1784-1834*, C. H. Philips, 1940.

**East Indies.** Popular name loosely applied to India, Indo-China, the Malay Peninsula, and more especially the islands of the Malay Archipelago, Sumatra, Java, Borneo, New Guinea, the Philippines, etc. All are described under their individual names. *See also* Indonesia.

**East Indonesia.** State of the United States of Indonesia, formed 1947 and comprising Celebes, Bali, Moluccas, Timor, Flores, Sumba and Lesser Sunda is., Lombok, and some smaller is. *See* Indonesia.

**East Kent Regiment, ROYAL.** Regiment of the British army. It originated in the City of London train-bands and was sent by Queen Elizabeth to help the Dutch, when it transferred to the Netherlands service and was known as the British Holland Regiment. In



East Kent  
Regiment badge

1665 it returned to the British service as the 3rd Foot, but from the colour of its tunic facings was known as the Buffs. The Buffs fought in Flanders under Marlborough, and were at Dettingen, 1743. They served throughout the Peninsular, Crimean, and South African Wars. The official title of the 3rd Foot was changed to the East Kent Regiment in 1881

Sixteen battalions were raised for service in the First Great War, and the regiment gained the battle honours: Aisne, 1914; Ypres, 1915; '17; Loos, Somme, 1916, '18; Arras, 1917; Amiens; Hindenburg Line; Struma; Jerusalem; Bagdad. In 1935 the East Kent Regiment was given the prefix Royal, and in accordance with the usual custom should have changed its facings to blue, but on account of its tradition was by special concession permitted to retain buff facings. At the outbreak of the Second Great War, a battalion was serving in Palestine, and a number of Palestinian companies were raised from among Jews and Arabs. This battalion served with the 8th army throughout the North African and Italian campaigns, another fought in the battle of France in 1940, and formations took part in the Normandy landings, June, 1944, and in the subsequent campaign in N.W. Europe, 1944-45.

**Eastlake, SIR CHARLES LOCK** (1793-1865). British painter and writer on art. Born in Plymouth, Nov. 17, 1793, he was taught drawing by Sam Prout and history painting by Haydon, later attending the schools of the Royal Academy. In 1827 he was elected A.R.A., in 1829 R.A., in 1842 librarian, and in 1850 president, of the Academy. That year he was knighted. He was the keeper of the National Gallery, 1843-47, and appointed its first director in 1855. The Escape of Francesco Carrara, 1834; Christ Weeping over Jerusalem (his masterpiece), 1841; and Sisters, 1842, are in the Tate Gallery. Eastlake's *Materials for the History of Oil Painting*, 1847, once enjoyed considerable vogue. He died at Pisa, Dec. 24, 1865.

**East Lancashire Regiment.** Formerly the 30th and 59th Foot British regiments, raised in 1702 for service as marines on board ship. They took part in the capture of Gibraltar in 1704 and in the subsequent naval action off Malaga. In 1727-28 they helped to defend Gibraltar, and in 1806 were in Baird's force which seized the Cape of Good Hope. In the Peninsular War the East Lancashires fought at Corunna, Badajoz, Salamanca, and Vittoria; they were at Waterloo and took part in the Mahratta War (1817-19). In 1826 the regiment distinguished itself at the capture of Bharatpur, as it did in 1854 at Inkerman; it shared in the storming of Canton (1857), the second Afghan War, and the Chitral expedition. It

did notable service in the South African War.

The East Lancashire Regiment raised 17 battalions in the First



East Lancashire  
Regiment badge

Great War and emerged with the following battle honours: Mons; Marne, 1914; Aisne, 1914. '18; Neuve Chapelle; Ypres, 1915, '17, '18; Somme, 1916 '18; Arras, 1917, '18; Dorian, 1917, '18; Helles; Kut-el-Amara, 1917.

During the retreat to Dunkirk in 1940, a company of East Lancashires held 1,000 yds. of the Canal de Bergues defences, and Major Irvine Andrews in command won the first V.C. of the Second Great War. The 2nd battalion was in Madagascar and then went to India, where it joined the 14th army and served throughout the Burma campaign. The regiment landed in Normandy in 1944, and was in heavy fighting at Caen, the 4th battalion suffering such heavy casualties that it was disbanded. The 1st battalion served on the Continent as infantry; the 8th, which had been transformed into a light A.A. regiment in 1941, was in 1945 transferred to the Royal Tank Regiment. The regimental depot is at Preston.

**Eastleigh.** Borough of Hampshire, England. In the valley of the river Itchen, it is  $5\frac{1}{2}$  m. N.E. of Southampton, on the railway. There are rly. workshops here for the manufacture of rolling stock. The land airport for Southampton, also known as Atlantic Park, which was a naval air station during the Second Great War, has aircraft factories. Regular services operate to the Channel Islands and elsewhere. Here also are cable and confectionery works. Pop. (including the dists. of Chandler's Ford and Bishopstoke) 30,000.

**East Liverpool.** City of Ohio, U.S.A., in Columbiana co. It stands on the Ohio river, 44 m. by rly. W.N.W. of Pittsburgh. The staple industry is porcelain manufacture, the city being the chief pottery centre of the country. The industry was founded in 1839 by James Bennett, who produced yellow and Rockingham ware. White ware was first made in 1872, and semi-vitreous china in 1890, porcelain being added later. Today most of the clay is brought



from Florida, Kentucky, North Carolina, and England. The city also makes foundry and machine shop products, electrical fixtures, bricks, barrels, and casks. Settled in 1798, East Liverpool was incorporated in 1834. Pop. 23,555.

**East London.** City and seaport of Cape Province, S. Africa. It stands at the mouth of the Buffalo

factures are not extensive. Haddington (co. town), Dunbar, and North Berwick are the principal towns. The co., formerly called Haddingtonshire, joins with Berwickshire to elect an M.P. Pop. est. 48,800.

**LITERARY ASSOCIATIONS.** Bishop Gilbert Burnet's first benefice was Saltoun. His pupil,

ander Peden, the Covenanter. There is much in the work of Sir Walter Scott concerning the county, notably in *The Bride of Lammermoor*.

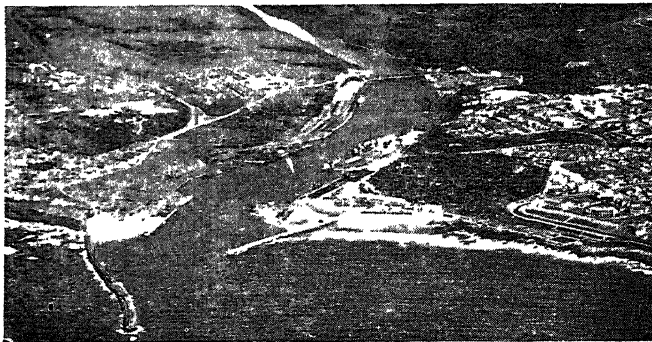
**East Lynne.** Novel by Mrs. Henry Wood (*q.v.*) published in 1861. It achieved an enormous contemporary success, was translated into all European and some Oriental languages, and is still widely read, while several dramatic versions have enjoyed almost equal popularity. The chief interest of the book—an interest which is intensified in the plays founded upon it—lies in the situation which develops when the erring Lady Isabel returns to her home and children disguised as a nurse. East Lynne has little literary merit, but the plot is well constructed and the reader's interest continuously sustained.

**East Malling Research Station.** Horticultural and plantation crop research and experimental farm and laboratory at East Malling, near Maidstone, Kent, England. It is one of the eight stations administered by the executive council of the Imperial Agricultural Committee (*q.v.*). Besides conducting experiments in improved methods of horticulture, it acts as a clearing house of information about its activities.

**Eastman, GEORGE** (1854-1932). American inventor. He was born at Waterville, N.Y., July 12, 1854, and educated at Rochester, N.Y. He experimented in the making of dry plates, and in 1880 began to manufacture them; four years later he produced the first efficient roll-film, and in 1888 perfected his first Kodak camera. Two years later he patented the first machine for making rolls of transparent film. As head of the various Kodak companies he amassed great wealth. He endowed the Rochester Mechanics'

Institute and the laboratories of the university of Rochester, and in 1912 gave £100,000 towards the endowment of that university. His other gifts included £30,000 to the Royal Free Hospital, London, in 1930. He died March 14, 1932.

**Easton.** City of Pennsylvania, U.S.A., the co. seat of Northampton co. It stands at the union of



**East London.** Air view, taken from the east, of this South African port and watering-place, which lies at the mouth of Buffalo river

river, mainly on the E. side 887 m. by rly. E. of Cape Town. It has a spacious harbour, and by dredging operations the great obstacle to its development, the bar at the river mouth, has been in large part overcome. There are ample wharves and other shipping accommodation. Apart from shipping the chief industries are connected with the trade of a large district. There is also some fishing. The chief buildings are the city hall and the public offices. The city is lit by electricity and has a service of electric tramways. It is a watering-place, with good facilities for sea bathing, and there is ample accommodation for visitors, including a space prepared for tents. Pop. 78,530 (39,646 Europeans).

**East Lothian.** S.E. maritime co. of Scotland. With about 40 m. of coast on the Firth of Forth and North Sea, its area is 267 sq. m. Along the S. border are the Lammermoor Hills (Lammer Law, 1,733 ft.), whence the surface has a gradual slope to the coast; in a few places isolated eminences occur—Garleton Hill (590 ft.), Traprain Law (700 ft.), and North Berwick Law (612 ft.). The Tyne, the chief stream, flows N.E. to the sea.

Agriculture and the pasturage of sheep, fishing and fish-curing, occupy a number of the inhabitants. The Dunbar red lands are an area of exceptional fertility. Large quantities of coal and limestone are obtained, but manu-

Andrew Fletcher, is generally known as Fletcher of Saltoun, and is widely remembered for his saying that so long as he might make the ballads for a people he cared not who made its laws. John Knox is believed to have been born in the Gifford Gate of Haddington, and was educated in the grammar school of this town. At Haddington, too, Jane Carlyle was born and is buried. John Home, author of *Douglas*, lived at Kilduff, and a statue to him stands in Haddington. At Gifford was born John Witherpoon, 1712-94, principal of Princetown College. At Ormiston is a granite obelisk to the missionary Robert Moffat, who was born there. The Bass Rock (*q.v.*) was at one time the prison of Alex-



**East Lothian.** Map of the Scottish maritime county formerly known as Haddingtonshire

the Lehigh and Delaware rivers. 76 m. by rly. W. of New York. Near the coalfield, it is a busy rly. and industrial centre, making cement and machinery, and has an airport. The seat of Lafayette College, founded 1832, it has a number of schools and a public library. Several treaties with the Indians were concluded here between 1756 and 1761. Founded 1750, it was incorporated in 1789, and became a city in 1887. Pop. 33,589.

**Easton's Syrup.** Syrup of iron phosphate with quinine and strychnine. Each fluid dram contains  $\frac{1}{2}$  of a grain of strychnine. It is used as a tonic in convalescence in doses of  $\frac{1}{2}$  to 1 fluid dram. It is also prepared in the form of sugar-coated tablets.

**East Orange.** City of New Jersey, U.S.A., in Essex co. Adjoining Newark and 12 m. W. of New York, across the Hudson, East Orange forms a unit of the pleasant, tree-shaded group of suburban residential communities known as The Oranges. It makes motor car and aeronautical equipment, dynamos, hydrants, and waterworks' supplies and tools. It is the seat of Upsala College, a Lutheran institution. Part of Orange until 1863, when it was incorporated as a town, it was chartered as a city in 1899. Pop. 68,945.

**East Prussia.** Until 1945 the easternmost province of Germany, separated from the rest of the country in 1919 by the Polish Corridor (*q.v.*) created under the Versailles treaty. Its area—excluding the Memel territory, likewise cut off from East Prussia, and including a district of former West Prussia—was 14,700 sq. m., and pop. 2,356,938, 84 p.c. Protestants. The area is a land of plains with a long ridge of hills up to 1,000 ft. stretching across the S., where also are lakes of different size, mostly surrounded by huge beech forests. The largest of these Masurian Lakes, the Mauersee and the Spirdingsee, each covers 40 sq. m. The capital was Königsberg, old coronation city of the Prussian kings, with 316,072 inhabitants; other large towns were Elbing (72,409) and Tilsit (57,286). But East Prussia was mainly an agricultural province; with Pomerania and Silesia, the main area for Germany's surplus grain, meat, and other food production; and the stronghold of the Prussian nobility and large estate owners, the Junkers. Sixty p.c. of the gainfully employed worked in agriculture, forestry, and food production.

Industrially, East Prussia had shipbuilding and wood-working yards, saw-mills, pulp and paper mills; sugar, textile, and cigar factories, breweries and distilleries; and a local industry in the exploitation of Baltic amber.

The province arose from the duchy of Prussia, seat of the Teutonic Knights left to them by the treaty of Torun (Thorn) in 1466. Secularised in 1525, it was acquired in 1618 by the Brandenburg dynasty of Hohenzollern; depopulated by a plague 1709–10, it was resettled by Frederick William I with colonists from the Palatinate, Switzerland, and Salzburg. It was occupied by the Russians, 1758–1762; rose, as part of Prussia, against Napoleon; and although in later history its name became a byword for reactionary politics, it was the birthplace of Liberalism in the 1820s, and of constitutional democracy in 1848. During the First Great War large parts fell twice into Russian hands, were liberated by Hindenburg, and rapidly reconstructed. In the Second Great War East Prussia suffered severely, and in Aug., 1945, was partitioned by treaty between the U.S.S.R. and Poland. *See* Masuria; Poland; also Russo-German Campaigns.

**East Riding.** Smallest of the three administrative divisions (O.E. *thriding*, third part) of Yorkshire, England, and for many purposes a co. of itself; area, 1,172 sq. m.; pop. 482,936. Its character is chiefly agricultural, though it contains Hull, the third seaport of England. Beverley is the ecclesiastical capital; Bridlington and Filey are seaside resorts. Much of the district is chalk; the wolds which continue into the North Riding rise to 808 ft. E. of Bugthorpe. The East Riding includes Flamborough Head and Spurn Head. It is bounded on the N.W. almost throughout by the Derwent, and on the S.W. by the Ouse from York to the beginning of the Humber. *See* Yorkshire.

**East River.** Salt water estuary or tidal strait connecting Long Island Sound and Upper New York Bay and separating Manhattan from Long Island, New York. It is 16 m. long and varies in width from 1,000 yds. to 3 m., receiving the waters of the Harlem, which is connected with the Hudson on the W. of Manhattan. Most of its islands are the sites of municipal hospitals and other institutions. Hell Gate is a treacherous rapid once a menace to navigation. The river is crossed by Brooklyn Bridge and six other

bridges. Under it run tunnels for underground rlys. and vehicular traffic. Franklin D. Roosevelt Drive has transformed the formerly squalid waterfront into one of the smartest residential areas in New York. A site on the Manhattan side of the river was selected in 1946 as the home of the United Nations.

**East St. Louis.** City of Illinois, U.S.A., in St. Clair co., on the left bank of the Mississippi, opposite St. Louis, Missouri, with which several bridges connect it. An important rly., industrial, and agricultural centre, it is the largest producing centre for alfalfa stock feed in the U.S.A., and has the world's largest horse and mule market. Manufactures include locomotives, rly. equipment, pneumatic tools, rolling mill products, white lead, paint, glass, and flour. The Keokuk dam plant provides hydroelectric power. East St. Louis was incorporated as a town in 1861 and chartered as a city in 1865. Pop. 75,609.

**East Surrey Regiment.** Raised in 1702, this British regiment served until 1713 as marines at Gibraltar and elsewhere. It then became the 31st Foot, and fought at Dettingen, where George II gave the men their nickname of the "Young



East Surrey Regiment badge

Bufs." In 1756 a second battalion was raised; this was numbered the 70th, and the two were united as the East Surreys in 1881. The regiment fought in America in 1776–77 and in the W. Indies in 1793–96. It rendered excellent service in the Peninsular War, especially at Talavera and Albuera. In 1842 it marched to Kabul and spent nearly two years fighting in Afghanistan; in 1845–46 it served against the Sikhs, and later in the Crimean War, the China War (1860), the New Zealand War (1863), and the Egyptian War (1884–85). Under Buller in the S. African War the regiment fought hard to relieve Ladysmith.

During the First Great War, the East Surreys expanded to 18 battalions and earned the battle honours: Mons; Marne, 1914; La Bassée, 1914; Ypres, 1915, '17, '18; Loos; Somme, 1916, '18; Albert, 1916, '18; Cambrai, 1917, '18; Selle; and Dorian, 1918. In the Second Great War they served in France in 1940 and in Africa,

Sicily, and Italy. A battalion with the 6th Indian infantry brigade took part in the campaign in Malaya from beginning to end, suffering such heavy casualties that it was formed into a composite unit with the remnants of a battalion of the Leicesters.

**Eastward Position.** Term applied to several observances of the Christian Church, especially to the position taken up by the officiating priest at the celebration of the Holy Eucharist and the practice of turning to the E. at the recitation of the creeds. The position of the priest has been the subject of much controversy in the Anglican Church consequent on the conflict between the rubric of 1552 and the replacing of the altar in 1660.

In the primitive Church converts at baptism turned to the W. when renouncing the devil and to the E. when confessing their faith in Christ. Thus Augustine says, "When we rise for prayer we turn towards the East." Chancels of churches are usually in the E., so that worshippers, when turning towards the altar, face the E. Similarly arose the custom of burying Christians with the feet towards the E. and the face upward, so that at the Resurrection they might be ready to meet Christ and be in a posture of prayer as soon as raised. Pagans commonly worshipped with their faces towards the rising sun, and the Christian adoption of the custom gave rise to the charge that they were sun-worshippers (Tertullian). The Jews in exile turned towards Jerusalem when they prayed (Dan. 6) and Mahomedans face Mecca. See Oxford Movement.

**Eastwood.** An urban dist. of Nottinghamshire, England. It is 9 m. by railway N.W. of Nottingham. The collieries provide the chief employment. Here took place the meeting of colliery owners which marked the first step in rly. construction from which the Midland rly. was developed. D. H. Lawrence was born here. Market day, Fri. Pop. 8,860.

**East Yorkshire Regiment.** Formerly the 15th Foot, this British regiment was raised in 1685 at



East Yorkshire Regiment badge

the time of Monmouth's rebellion. After serving in Flanders (1694-97), it was engaged in Marlborough's campaigns, and was one of the regiments that



**Eatonswill.** Election-day rowdiness in this famous fictitious borough, as depicted by "Phiz" in one of the original illustrations to *The Pickwick Papers*

led the attack at Blenheim. In 1758-59 it served under Wolfe in the capture of Louisbourg and Quebec. The East Yorkshires did good work in seizing the West Indian Islands from the French both before and after they served against the American Colonists. They fought in the Afghan War of 1879-80, and one battalion was in the 8th division during the South African War.

Twenty-one battalions of the East Yorkshire Regiment served in the First Great War and gained the honours: Aisne, 1914, '18; Armentières, 1914; Ypres, 1915, '17, '18; Loos; Somme, 1916, '18; Cambrai, 1917, '18; Selle; Dorian; and Gallipoli, 1915. During the Second Great War regular and territorial battalions served in France and particularly distinguished themselves in the fighting round the Escaut position. The regiment fought throughout the North African and Sicily campaigns, and landed in Normandy on D-Day. Thereafter they fought in France and the Netherlands.

**Eatonswill.** A fictitious E. Anglian town depicted in Dickens's *Pickwick Papers* as the scene of a parliamentary election of 1830, i.e. some 40 years before the introduction of the ballot box.

Incidents in the town and at the hustings are burlesqued with memorable gusto, free fights and unlimited bribery and corruption being the order of the day. Thus the name is perpetuated as a symbol for the rowdier aspects of electioneering. Propaganda in the U.S.S.R. is said to have cited this extravaganza, written in 1836, as a serious argument against western methods of democratic government.

**Eaton Hall.** Seat of the duke of Westminster, Cheshire, England. It stands on the river Dee, 4½ m. S. of Chester. A Gothic structure, built 1869-82, from designs by A. Waterhouse, the third on the same site, it stands in a well timbered demesne of 400 acres. The interior is richly decorated, and besides examples of Rubens, West, and Millais, the pictures include a fine collection of portraits of famous racehorses owned by the family. A bronze by G. F. Watts stands before the hall. An officers' hospital in the First Great War, the mansion housed naval cadets from Dartmouth in the Second, and became the O.C.T.U. centre for Western Command in 1946.

**Eaton Socon.** Village of Bedfordshire, on the border of Huntingdonshire, England. It is on the

Great North Road, 7 m. N.E. of Bedford. A remarkable restoration of the Norman church followed its destruction in 1930. The remains of Bushmead priory are 12th century. Bunyan was arrested after preaching in the village in 1658. Dickens mentions the inn in *Nicholas Nickleby*.

**Eaton Square.** Largest square in Belgravia (*q.v.*), London, S.W. Covering about 5 acres, it has six gardens, is named from the duke of Westminster's Cheshire seat, Eaton Hall (*q.v.*), and was built 1827-53. At the E. end is the church of S. Peter, 1824-26, restored 1872, where many fashionable marriages have taken place. No. 71 was, for a time, the official residence of the speaker of the house of commons. Sir Henry Wilson was assassinated in Eaton Place in 1922.

**Eau Claire.** City of Wisconsin, U.S.A., the co. seat of Eau Claire co. At the confluence of the Eau Claire and Chippewa rivers, 88 m. E. of St. Paul, it is served by several rlys. Its buildings include a Carnegie library and state teachers' college. The commercial centre of N.W. Wisconsin, outlet for the Chippewa lumber district, Eau Claire makes machinery, refrigerators, aluminium products, tires, and harness. Settled in 1846, it was granted a city charter in 1872. Pop. 30,745.

**Eau-de-Cologne.** A perfume said to have been invented by an Italian chemist, Johann Maria Farina, who settled in Cologne in 1709. It is believed that the original recipe was lost and never recovered, though many chemists in Cologne, using the name Farina, claim to be the sole owners of it. The perfume is prepared from alcoholic vegetable extracts, essential oils, and rectified spirits. The usual recipe prescribes twelve drops of each of the essential oils, bergamot, citron, neroli, orange, and rosemary, with one dram of Malabar cardamoms and a gallon of rectified spirits, which are distilled together. Eau-de-Cologne is largely made in Great Britain, where the oils are mixed with a highly purified spirit, and distillation is unnecessary.

**Eau-de-Javel.** Bleaching liquid first made in 1789 at the Javel chemical works, Paris. It was the first practical means of utilising the bleaching properties of chlorine. Eau-de-Javel, prepared by passing chlorine gas into a solution of potash, was also employed as a disinfectant. Shortly afterwards Charles Tennant, of

Glasgow, prepared bleaching powder by passing chlorine gas over quicklime, and Labarraque, a French chemist, made a better bleaching liquid, eau-de-Labarraque, which is a solution of sodium hypochlorite made from sodium carbonate and calcium hypochlorite.

**Eau-de-vie** (Fr., water of life). Old French name for brandy. The product of a distilled wine was so called in the 13th and 14th centuries, and the name is still used. The eaux-de-vie de marc are distilled from wine lees or from the residue in the stills after the best brandy has been made. See Brandy; Fire-Water.

**Eaux-Bonnes.** Watering-place of France. In the dept. of Basses-Pyrénées, it is 28 m. S. of Pau. It stands 2,460 ft. high, just where two streams, coming down from the Pyrenees—the Sourde and the Valentin—meet, and is named on account of its waters. These have been known since the 14th century, and are good for lung and other troubles. Winter sports are held.

**Eaux-Chaudes.** A watering-place of France. In the dept. of Basses-Pyrénées, it is 5 m. S.W. of Eaux-Bonnes, standing where a stream, the Gave d'Ossau, comes down from the Pyrenees, its valley being one of the most beautiful in the neighbourhood. The town has hot springs—hence its name—which, being sulphurous, are good for rheumatism, affections of the respiratory organs, etc.

**Ebb.** Reflux or return of the tide-water towards the sea. Ebb tide occurs when tidal water returns to the lowest point it can reach on any particular day.

**Ebbsfleet.** Coast hamlet of Kent, England. It stands on Pegwell Bay, 3½ m. S.W. of Ramsgate, and is the traditional landing point of Hengist and Horsa in 449-450, and also the place at which S. Augustine and his forty monks disembarked in 597.

**Ebbw Vale.** An urban district of Monmouthshire, England. It stands on the Ebbw-fawr, a head-stream of the Ebbw, 21 m. N.W. of Newport, and is served by two railways. In a busv colliery district, it has large tinplate works, iron and steel being also manufactured on a large scale and the coal exported. Christ Church is a modern building in the Early English style. A parl. div. is named from the town. Market day, Sat. Pop. 27,653. *Pron.* Ebboo.

**Ebenaceae.** Family of trees and shrubs: the ebony family. They have alternate, undivided

leaves, and regular flowers, succeeded by berries. They are chiefly natives of tropical countries. The timber is hard and dark-coloured. See Ebony.

**Eben-Emael.** A fortress of Liège, Belgium. When the Germans invaded Belgium on May 10, 1940, the fortress system of Liège was one of the main bastions of the defence. Eben-Emael, the most modern of the fortifications, covered 200 acres. Tremendous attacks were developed by German heavy artillery, bombing planes, and waves of infantry. Parachutists landed on the top of the fort in darkness, and put the defensive armament out of action by thrusting bombs and explosives through the casemates. The remaining forts held out for some days, but the Germans claimed the capture of all the inner works by May 21. In the course of the liberation of Belgium, Eben-Emael was captured by the Allies Sept. 12, 1944. See illus. p. 1061.

**Ebenezer** (Hebr., stone of help). Name of an unidentified spot where the Hebrews were defeated by the Philistines (1 Sam. 7); also that of a stone set up by Samuel near Mizpah in memory of an Israelitish victory over the Philistines (1 Sam. 4). It is used as a Christian name.

**Eberhard** (1445-96). Duke of Württemberg. Born Dec. 11, 1445, a member of the ruling family of Württemberg, he became count of one part of it in 1457. In 1482 he secured the rest of the country, and in 1495 was raised to the rank of a duke. By uniting Württemberg and by obtaining support for certain changes, both from the emperor without and from his own nobles within, he is regarded as the founder of the country. One who shared in the intellectual awakening of his time, he founded the university of Tübingen and encouraged scholars. Eberhard, who was known as the Bearded (im Bart), died Feb. 25, 1496, at Tübingen.

**Ebers, GEORG MORITZ** (1837-98). German Egyptologist and novelist. Born March 1, 1837, at Berlin, he studied at Göttingen and Berlin, and early specialised in Egyptology. To popularise his favourite study through the medium of fiction, he wrote *An Egyptian Princess*, 1864, Eng. trans. 1870-71. In 1865 he became lecturer and later professor in Egyptology at Jena, and held a similar post at Leipzig 1870-89.

After his first travels in Egypt, Ebers wrote *Egypt and the Book of Moses* 1868. He revisited

Egypt in 1872-73, and discovered at Thebes one of the finest examples of ancient papyrus—Papyrus Ebers, now in the Leipzig Museum. This is a medical treatise from Sais of the 16th century B.C. Ebers also wrote historical novels descriptive of South Germany and the Netherlands in the 16th century. He died at Tutzing, Aug. 7, 1898. His Autobiography was translated into Eng. by M. J. Safford, 1893.

**Ebert, Friedrich** (1871-1925). German statesman. Born at Heidelberg, Feb. 4, 1871, and educated at an elementary school, he was apprenticed to a saddler of that town. In 1892 he became editor of the Socialist organ, Bremer Bürgerzeitung, and in 1894 married Louise Kamp, who, he said, proved his best counsellor throughout his career. Leader of the Socialists by 1916, in the revolution of 1918 he succeeded Prince Max of Baden as chancellor on Nov. 9, and then became provisional president of Germany. The first Socialist president maintained his position through the stormy days of Jan., 1919, and at the opening of the new national assembly at Weimar on Feb. 6, made a long protest against the armistice terms, and urged the union of German Austria with Germany. On Feb. 11 Ebert was confirmed in the presidency of the republic which he held until his death on Feb. 28, 1925. His rule was tactful and statesmanlike and he was held in respect by the German states. He published several books, including a study of German Social Democracy, 1924.

**Eberth, Karl Joseph** (1835-1926). German bacteriologist. Born in Würzburg, Sept. 21, 1835, he studied under Kolliker and Virchow. He was professor at Zurich, 1874, and at Halle, 1881-1911. He made important contributions to bacteriology, and in 1880 discovered the typhus bacillus which bears his name. He died Dec. 2, 1926.

**Ebionites** (Hebr. *ebyōn*, poor). Name given to certain Judaizing sects in the Christian Church in the 2nd century. Denying the divinity of Christ, they regarded Christianity as merely a reformed type of the Jewish religion, and Christ as only a natural man of exceptional spiritual attainments acquired by a strict observance of the law of Moses. References in the writings of Irenaeus and other Fathers state that the Ebionites observed all the details of the Mosaic Law, recognized only the

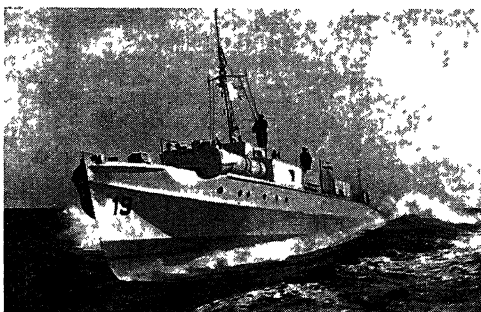
Gospel of S. Matthew, and rejected S. Paul as an apostate. At a later period many of the Ebionites held the Gnostic heresy of the dualistic origin of the universe.

**Eblis** or **IBLIS**. A Mahomedan name for Satan or the prince of darkness. In the Koran it is stated that God, having made Adam, called upon the angels to bow down and worship him; all did so except Eblis, who refused, and became the declared enemy of the newly created race of men. Eblis is also described as chief of the genii.

**E-Boat**. Popular but incorrect name given to the *Schnellboot* (Ger. swift boat), or motor torpedo-boat used by the Germans in the Second Great War. The name was incorrectly applied under the impression that the German term was *Eilboot* (speedboat); whereas the official title was *Schnellboot* and the letter S was prefixed to a vessel's number. The largest type displaced 86 tons on a length of 105 ft. and was driven by Diesel engines developing 2,400 h.p. to give a speed of 33 knots.

There were two 19-7-in. torpedo-tubes mounted on either beam and firing forward. With a crew of 19, the vessel had a range of 600 m.

*Schnellboote* were the most active of the German surface craft during the war, frequently attacking Allied convoys in the English Channel and the Mediterranean. Lying low in the water, they were inconspicuous and could launch their torpedoes before their targets detected their presence. They made extensive use of smoke both before and after attack. Their activities were eventually checked by sweeps organized by the R.A.F. and by motor torpedo boats. See Coastal Craft.



**E-Boat.** German motor torpedo-boat of the Second Great War, here seen at high speed

**Ebonite** or **VULCANITE**. Hard vulcanised rubber made by mixing pure rubber with about one-third of its weight of sulphur, and heating for a number of hours in temperature rising to 300° F. Ebonite is often used as a substitute for bone, ivory, and horn, for making small ornamental articles like combs, knife handles, buttons, etc. It can be moulded, cut, carved, and polished to a high degree of perfection. It has good electrical insulation properties, though for high frequency work plastics have been found more satisfactory. See Rubber.

**Ebony** (*Diospyros*). Trees of the family Ebenaceae, whose heart-wood is the ebony of commerce. Several species furnish the timber, the difference being denoted by the place of origin. Mauritius ebony is the produce of *D. ebenum*; this, with that produced by *D. reticulata*, is the finest known. Coromandel ebony comes from *D. melanoxylon*. Calamander wood, a variegated ebony, is the timber of *D. quae-ita* from India and Ceylon. Some species have edible fruits. See Date-plum; Persimmon.

**Ebor**. Abbreviation of Eboracum or Eburacum, the Latin name for York. It is still used as a signature by the archbishop of York, e.g. Cyril Ebor. See York.

**Eboue, Adolphe Félix Sylvestre** (1884-1944). French administrator. Éboué, the son of an African negro, was born in Cayenne, French Guiana, and educated at Cayenne College and the Sorbonne, Paris. He entered the French colonial service and in 1936 became governor of Guadeloupe, the first man of colour to rise to that position. Governor of Lake Chad Territory from

1938, he refused to capitulate at the order of Vichy and declared for de Gaulle, Aug., 1940, thereby securing for the Allies the whole of Central Africa from W. to E. He became governor-general of French Equatorial Africa in Nov., 1940, and died in Cairo, May 17, 1944, while on his way to the Lebanon.



**Ebony.** Fruit and leaf of Persimmon, an ebony tree

**Ebro** (anc. *Ibērus*). River of N.E. Spain. Rising in the Cantabrian Mts., in the prov. of Santander, it flows S.E. to the Mediterranean. Its length is about 460 m., and it drains some 35,000 sq. m. Its chief affluents are the Jalon, Huerva, Guadalupe, Aragon, Gallego, and Segre. Running through narrow valleys, its channel is obstructed by shoals and rapids. Ships can proceed only as far as Tortosa (16 m.).

During the Spanish Civil War, 1936-39, there was heavy fighting along the line of the Ebro when government forces launched an offensive across the river in July, 1938, to relieve pressure on the Sagunto sector. Gen. Franco's troops were taken by surprise, and the Ebro was crossed on July 25. Gandesa was almost enveloped, despite frequent and costly counter-attacks. On Aug. 7 Franco began a counter-offensive and made some progress; but during the ensuing three weeks neither side gained any real advantage. Some 300,000 men were engaged in a sixth attack on Oct. 2, but, despite great superiority in the air, Franco's troops achieved only local gains, and by the end of the month the government forces were still inside his territory. On Nov. 7 the Nationalists seized the bridgehead of Mora de Ebro; by the middle of that month the government forces had been cleared from the left bank of the river, which was recrossed on the 16th. The Ebro battles laid the foundations for Franco's conquest of Catalonia; the losses incurred by the government army, estimated at 40,000, could not be replaced and undermined morale. The Nationalists employed massed artillery and extensive bombing in this campaign, while the government relied on intricate field fortifications.

**Ebullioscope**. Apparatus for determining the boiling-point of a liquid, e.g. in working out molecular weights. It is sometimes employed for ascertaining the alcoholic strength of solutions from the temperatures at which they boil.

**Eburacum** or **EBORACUM**. Roman town on the site of which the city of York, England, now stands. Erected by the Ninth legion on an earlier Caer Eborac about A.D. 75, the fort of 52 acres—still traceable in the lower courses of the multi-angular tower—was garrisoned by the Sixth legion. A municipal colonia flourished on the opposite bank of the Ouse. Here in 120

Hadrian held court, here also died Severus in 211, and Constantius Chlorus in 306. *Pron.* Eburācum. *See* York.

**Eça de Queiroz, JOSÉ MARIA** (1845-1900). Portuguese author. Born at Povoá do Varzim, near



J. M. Eça de Queiroz,  
Portuguese author

Oporto, Nov. 25, 1843, and educated at Coimbra university, he joined in 1871 the staff of the critical journal *As Farpas*. In 1874 he published a novel which attracted a good deal of attention, *O Crime do Padre Amaro*. He was Portuguese consul successively at Havana, Newcastle, Bristol, and Paris. His later stories included *O Primo Bazilio*, 1877 (Eng. trans. *Dragon's Teeth*, 1889) and *A Reliquia*, 1886. The posthumous collection of *Contos*, 1902, contained the famous stories *O Defunto* and *O Suave Milagre*, translated into English as *Our Lady of the Pillar* and *The Sweet Miracle*. He died Aug. 16, 1900.

**Écarté** (Fr., discarded). A card game for two players which had a great vogue in France at the beginning of the 19th century. The six down to the two inclusive of each suit having been removed from the pack, the players cut for deal, and the pack is shuffled by the dealer, and cut by his opponent. The dealer then gives five cards to the other player and to himself: either three and two or two and three alternately. The eleventh card is turned up for trumps, the remainder of the pack forming the stock. Should the eleventh card be a king the dealer scores one point; otherwise the turn-up has no scoring value.

The players then look at their hands, and should the non-dealer (the leader) be satisfied with his cards, he may at once proceed to play them. But if he considers it would be advantageous to change any or all of them, he says, "I propose" or "Cards." The dealer then has the option of changing his cards also, and on deciding to do so says, "I accept" or "How many?" Should he be satisfied with his cards, he may refuse, and exclaim "I refuse" or "Play." If either player refuse to change cards, then both must play their original hands. Otherwise, the discarding of cards for others in the stock may proceed so long as both are agreeable. The players

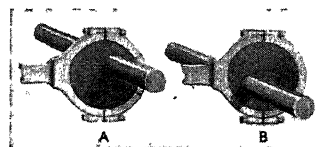
being satisfied with their hands, the play begins. If either holds the king of trumps he must declare it before playing his first card, and is entitled to mark one point.

The object of the game is to make tricks; the highest card of a suit wins, though a trump naturally scores over any card of another suit. A player must always take a trick if able to do so. The cards rank in this order: King, queen, knave, ace, ten, down to seven. The winner of a trick always leads to the next. The score is made as follows: Turning up or holding the king of trumps counts 1; winning three tricks out of five is called the *point* and also counts 1; winning all five tricks is termed the *vole* and counts 2. If either player fail to make three tricks after having declined cards, his adversary scores 2. A game consists of 5 points.

**Ecbatana**. Ancient capital of Media, now in N.W. Persia. The Hebrew form *Achmetha* (*Ezra* 6) survives in the modern *Hamadan*. Situate 5,930 ft. above sea-level, near Mt. Elwend, it was the summer residence of the old Persian and Parthian kings. Its identification with the seven-storeyed fortress described by Herodotus as built by Deioeces (700 B.C.) is in doubt. The so-called Syrian Ecbatana was at Hamath.

**Ecce Homo** (Lat., Behold the Man). Short title of a survey of the life and work of Jesus Christ by Sir J. R. Seeley. It was published anonymously in 1866, and caused a storm of criticism. It attempted to present Christ as an exclusively human personality, the founder of a new system of society.

**Eccentric** (Gr. *ekkentros*, out of the centre). In engineering, a metal disk, mounted eccentrically on a shaft, to give reciprocating movement to a valve or pump or lever. The edge of the eccentric is grooved and encircled by an eccentric strap, one half of which is secured rigidly to the front end of a connecting-rod. In effect an eccentric is a cam: or it may be regarded as a crank having a pin larger than the shaft. *See* Link Motion; Steam Engine.



Eccentric. Metal disk on a shaft fixed out of centre. A and B show two positions of this moving shaft



**Ecclefechan.** Village of Dumfriesshire, Scotland. It is 6 m. S.E. of Lockerbie by railway, and it has been identified as the original of Entepfuhl in Thomas Carlyle's *Sartor Resartus*. It was Carlyle's birthplace and burial place. Near by are the Roman camps of Birrens and Birrenswark. Pop. 988. See Carlyle *illus.*

**Eccles.** Mun. bor. of Lancashire, England. It stands on the Irwell, 4 m. W. of Manchester, of which it is an industrial suburb, and is served by the railway. Famous for Eccles cakes (made of pastry with currants), the town has cotton and other textile industries. It has an old church, presumably the origin of its name. Pop. 40,694. See Manchester.

**Ecclesfield.** Parish of the West Riding of Yorkshire, England. It is 5 m. W.N.W. of Sheffield, and is served by two rlys. The Perpendicular church of S. Mary, formerly designated the Minster of the Moors, contains some fine oak carving. There are cutlery and tool works, paper mills, iron works, and collieries. Pop. 16,019.

**Ecclesia** (Gr. *ekkalein*, to call forth). In ancient Athens, the assembly of the whole body of free citizens. The meetings were held in the Pnyx and latterly in the theatre; on special occasions they were held in the agora. In theory the ecclesia was the supreme power in the state, and any citizen had the right to speak; but in practice its power was virtually confined to the business which had been prepared for it by the *boulê*, or council of 500. Voting was by show of hands, and on special occasions by ballot. In addition to some 40 regular meetings a year, the ecclesia could also be convoked for special business by a chief magistrate. The Greek name *ecclesia* (Fr. *église*) came to be applied in Christian times both to the assembly of Christians and to the place of assembly. See Cathedral; Church.

**Ecclesiastes.** Title adopted, through the Vulgate, from the Septuagint, for the O.T. book which in Hebrew bears the title *Kôheleth*. The meaning of the Hebrew term is disputed, but may be "one who speaks in an assembly" (hence Jerome's rendering *concionator* and the English translation "the Preacher"). In chap. 1, *vv.* 1, 12, the writer seems to be identified with King Solomon, to whom tradition ascribed the authorship. But the language of the book, which contains Persian and possibly

Greek words, and represents a transitional stage in the development of Mishnic Hebrew, is that of an age much later than Solomon's. The book cannot, however, be later than Ecclesiasticus (c. 200 B.C.), which pre-supposes its existence. It presents a strange mingling of despair and pessimism ("Vanity of vanities. all is vanity") with an irresistible sense of the goodness of God. Thus the writer's utterances often seem contradictory.

The true explanation seems to be that the book is a series of reflections representing two or more moods, or in other words is the record of the negative and positive phases in a soul's struggle for light. Hence, probably under Greek influence, a philosophic materialism and epicureanism; under the influence of national subjection, a general despondency; and yet, under the influence of an innate religious trend, an unquenchable faith in a divine dispensation. The materialistic element will account for the hesitation with which the book was admitted into the Hebrew Canon. The writer in one mood sees little profit or progress in life; the same happenings recur perpetually (*cf.* Nietzsche's philosophy). The best course in life seems to be to eat and drink and enjoy things as much as possible. But in another mood the writer realizes that true happiness is dependent upon fear of God and obedience to His commandments.

**Ecclesiastical Commission.** Body constituted in 1836 to manage the extensive estates of the Church of England. Under its direction the large incomes of certain bishops and other dignitaries were gradually reduced to a more uniform scale.

In certain cases in 1836 the dean and chapter refused to hand over the cathedral estates to the commissioners, and several such incomes were reduced owing to agricultural depression. Those which took the other course received a fixed income whatever the rent-roll of the surrendered estates might be. The commission dealt with an annual income of nearly £2,000,000, and after paying the various stipends it usually set aside some £400,000 a year for increasing the endowment of poor livings and providing for the foundation of new ones.

In 1947 this body was merged in the new Church Commission (*q.v.*), its members becoming known as the Church Commissioners for England. Consult Num-

ber One Millbank: The Story of the Ecclesiastical Commission, J. R. Brown, 1944.

**Ecclesiastical Courts.** Courts of law that deal with offences against ecclesiastical law, *i.e.* cases affecting benefices and the like. Such are in their nature confined to the established church. The courts held by the Pope and by the various prelates of the R.C. Church are ecclesiastical courts.

In England clerics are now for practical purposes on the same footing before the law as laymen. Formerly this was not so, and the church courts dealt with all kinds of offences committed by clergymen as well as with all cases affecting marriage (divorce, etc.) and wills—two subjects which the church regarded as peculiarly its own. The process of reducing the powers of the ecclesiastical courts was a gradual one, but by about 1860, the date of the Ecclesiastical Courts Jurisdiction Act, they may be said to have been confined to their present duties, dealing only with cases affecting church discipline, and no longer with any that are offences against the state. In 1855 their jurisdiction in cases of defamation was taken away, and in 1857 they lost that affecting wills and matrimony.

The existing ecclesiastical courts in England are the courts of arches, presided over by the dean of arches, which is the chief court in the province of Canterbury, and the chancery court, which fulfils the same purpose for the province of York, and is presided over by the official principal.

The court of arches hears appeals from the consistory courts, and from it there is an appeal to the judicial committee of the privy council. Until 1833 these appeals were to the court of delegates of appeals, which dated from the time of the Reformation.

Each diocesan bishop has his court, called the consistory court, over which the chancellor of the diocese presides. The archdeacons have courts, which, however, have little to do. Each archbishop has an almost obsolete court of audience, and also the court of the vicar-general, which deals with the confirmation of the elect on of bishops, gives advice to convocation, and controls the issue of marriage licences. The law administered in the church courts was mainly canon law and English statute law so far as it concerned the Church. See Canon Law; Church of England; Curia, Ecclesiastical Law.

# ECCLESIASTICAL LAW IN ENGLAND

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*This article deals with Ecclesiastical Law, the main branch of which is that under which the Church of England lives and works.*

*Another aspect of the same subject is dealt with under Canon Law  
See also Church of England*

Ecclesiastical law is here used to mean the law affecting the Established Church of England. Other churches are subject to the general common law and statute law affecting corporate or non-incorporate bodies. In the Middle Ages, English ecclesiastical law was the canon law of the western European church, supplemented, and in some cases modified, by the statute law of the realm and by the common law derived from custom. Indeed, it has been argued that the canon law itself was regarded as an undefined part of the common law, probably because it also largely represented the codification of ecclesiastical custom.

The legislation of Henry VIII shifted the centre of gravity of English ecclesiastical law from the canon law to statute law, and the guiding legal principles and maxims of English ecclesiastical law since his time are to be found in his legislation, notably in the Act of Supremacy (1534), modified in the reign of Elizabeth (1559) and of later sovereigns. At the same time, the principles of English common law have been more and more applied to the church.

## Relation to Old Canon Law

The exact relation of modern English ecclesiastical law to the old canon law has never been precisely defined by statute, by the courts of the realm, or by any other competent authority. Many of the regulations of the medieval canon law were embodied in the Canons of 1604, which became binding upon the clergy, but not (except in so far as they repeat existing law or apply to church officers) upon the laity. In 1939 a commission was appointed to prepare the first revision of these canons for over three centuries. The recommendations of this commission were published in May, 1947.

The canons of 1604 did not, however, close the door of appeal to the rest of the medieval canon law. Many authorities regard that canon law as part of the English ecclesiastical law, save in so far as any of its provisions conflict with the statute law or custom of the realm. This lack of definite legal precision places English ecclesiastical law at a disadvantage when compared with the *Codex Juris Canonici* (1917) of the R.C. Church.

Another considerable modification of the medieval jurisdiction still surviving in the English ecclesiastical courts took place in 1857, when all cases concerning marriage (other than the grant of marriage licences), divorce, and wills were transferred from the church courts to new secular courts.

## The Enabling Act

The Church of England Assembly (Powers) Act (1919), commonly called the Enabling Act, set up a new legislative body for the church called the National Assembly of the Church of England, otherwise the Church Assembly. This consists of the house of bishops, the house of clergy (embodying the lower houses of convocation of the two provinces of Canterbury and York), and the house of laity (elected). When agreed upon, its measures go before the ecclesiastical committee of the two houses of parliament, also created by the Act of 1919. The measures can then be debated by both houses of parliament, but if no debate is demanded, and this is the usual course of procedure, then, after the consent of both houses of parliament has been obtained, the measures go forward for the royal assent, and so become part of the statute law of both church and state. Between 1920 and 1945 over 90 measures of new ecclesiastical legislation were added to English ecclesiastical law in this way, and the process continues.

The church assembly has no power to interfere with the canons or to encroach upon the duties and privileges of the convocation of the provinces of Canterbury and York. These are part of the ancient constitution of the realm, and grew up side by side with parliament—indeed, preceded it. Together with the lords and commons, they formed a kind of third estate, and at one time had the right to authorise separate taxation of the clergy, which differed in amount and incidence from that imposed by parliament upon the laity. The houses of convocation of the two provinces, which sit separately in London and York, may with the royal sanction promulgate legislation of a canonical and doctrinal character, but only so far as it does not infringe the

statute and common law of the land. In comparison with the legislation passed by the church assembly, that undertaken by the convocations in modern times has been small.

Ecclesiastical law relates to the affairs and discipline of archbishops, bishops, clergy, and lay officials of the church and to the laity generally in all matters where the faith, forms of worship, rites and ceremonies are concerned; to the fabric of the church, rectory and vicarage houses and other buildings which are church property. Revisions proposed in 1947, for example, dealt among other matters with procedure for baptism, qualifications of sponsors and of churchwardens, the hearing of confession, the anointing of the sick, the ordering of deaconesses, and the interchange of pulpits with nonconformists.

Ecclesiastical law is in the U.K. administered in both ecclesiastical and civil courts, with the usual course of appeal, in the case of diocesan courts to the provincial court and the privy council, and in the case of the high court to the court of appeal and the house of lords. The 1947 proposals included suggestions for the simplification of church courts. *Consult Law Relating to Church and Clergy* H. W. Cripps, 7th ed. 1921.

**Ecclesiastical Titles Act.** Act passed by the British parliament in 1851. It was a reply to the brief of the Pope Pius IX which restored the Roman Catholic hierarchy in England, making Westminster an archbishopric and selecting various towns, not occupied by Anglican bishops, as new seats for the episcopate. In response to Protestant political agitation Lord John Russell introduced the bill, which was passed into law. The Act was from the first a dead letter, and was repealed in 1871.

**Ecclesiasticus.** Name in the Vulgate of one of the most important of the O.T. Apocrypha, which in the Greek version is called the "Wisdom of Jesus, son of Sirach." The book was called Ecclesiasticus ("belonging to the Church") because, though not canonical, it was considered suitable for use in the public worship of the Western Church. By the decree of the Council of Trent it was declared a canonical book of the O.T. in the Roman Catholic Church.

It was originally written in Hebrew, between about 190 and 170 B.C., by Jesus the son of Sirach and was translated into Greek soon after 130 B.C. by a grandson of the

same name. The Hebrew text was lost until 1896, when Mrs. Agnes Lewis discovered a fragment in Palestine. Subsequently other fragments came to light, and now the greater part of the work can be read in Hebrew. The book belongs to a class of Hebrew literature known as Wisdom Literature. The author gathers up ethical proverbs, precepts, and wise sayings concerning various matters in the conduct of life. See Apocrypha.

**Ecclesiazusae.** Comedy of Aristophanes, produced 392 B.C. It represents the women of Athens as controllers of public affairs and founders of a socialistic state in which property and husbands were held in common, as in Plato's Republic. The title means Women in the Ecclesia (general assembly).

**Ecclesiology** (Gr. *ekklesia*, church, assembly; *logos*, discourse). Science treating of the organization and development of Christianity and of ecclesiastical architecture and decoration, especially in regard to their liturgical significance. See Christianity; Church.

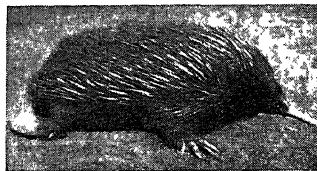
**Ecdysis.** Zoological term for the shedding of a skin or shell, e.g. of an insect or crustacean. The cast skin is the exuviae and the intervals between successive ecdyses during the life of the animal are instars.

**Echegaray y Eizaguirre, José** (1832-1916). Spanish dramatist, poet, and politician. He was born, April 4, 1832, at Madrid, and educated at its university. Before entering politics, 1868, he was a teacher of mathematics. He held office in the Radical-Monarchist government of 1872-73, as minister of education, and in 1874 and 1905-06 was minister of finance. His versatility was extraordinary, and he was a director of commercial companies, as well as a philosopher and poet. In 1904 he won the Nobel prize for literature. His dramas, numbering over eighty, have been translated into most European languages, and he is regarded as the founder of the new school of Spanish dramatists. The plays include *Mariana*, 1893, adapted in English, 1897, at the Court, and revived, with Mrs. Patrick Campbell in the title rôle, at the Royalty, 1901; *El Gran Galeoto*, 1881, produced in London, 1889, under the title of Calumny. Echegaray died Sept. 16, 1916.

**Echelon** (Fr., rung of a ladder). Military term. Troops, warships or aircraft are said to be in echelon formation when the second unit is to the rear and to the

flank of the leader, the third similarly placed in relation to the second, and so on. In the case of aircraft in echelon, each machine is usually stepped in relation to that immediately in front. This is to provide additional defensive protection to the formation. The army uses the term B echelon for second-line transport, etc., and servicing units attached to R.A.F. bomber and fighter squadrons are also known as echelons.

**Echidna.** Spiny ant-eater of Australia and New Guinea, of which there are two species, the



Echidna. An egg-laying mammal of Australia

five-toed and the three-toed. They are egg-laying with a common opening of genital ducts, urethra, and rectum called a cloaca, and are thus Monotremata. The back of the head and body is covered with short spines, like porcupine quills, and the head is provided with a slender beak. In the breeding season the female lays a single egg, which is incubated in a pouch on the underside of the body.

**Echinodermata** (Gr. *echinos*, hedgehog; *derma*, skin). Phyla of invertebrate marine animals. They comprise the feather-stars (Crinoidea), star-fishes (Asteroidea), brittle-stars (Ophiuroidea), sea-urchins (Echinoidea), and sea-cucumbers (Holothuroidea); certain other orders are represented only by fossils. They are organized on a five-rayed symmetrical plan, though this is not at once evident in some of the sea-cucumbers. The skeleton consists of a soft integument in which is deposited carbonate of lime in the form of plates, bars, or spicules. Although there is no distinct head, there is a mouth on the underside, except in the sea-cucumbers, where it is placed at one of the two extremities.

The nervous system has its principal seat in a five-angled ring around the gullet, from which branches radiate in all directions. There is no heart; but there is a system by which the products of digestion are circulated. Of a complex system of coelomic spaces, one set accounts for the most remarkable feature of echinoderm organization: the series of water-vessels

known as the ambulacral system, from its function of supplying hydraulic power for locomotion.

The outer surface of the echinoderms varies in the several orders. In the sand-stars and brittle-stars it consists of overlapping plates which allow the rays to be thrown into horizontal curves; in the common star-fish and its near allies it is studded with hard bosses and short spines; and in the sea-urchins it is armed with long or short spines which move on ball-and-socket joints. There are also sense organs of varying character in the different groups. The star-fishes have rudimentary eyes at the tips of the rays.

The echinodermata are of the widest distribution, being found in all seas, at all depths. They are an ancient group, for their fossil remains are found in rocks as far back as the Ordovician period.

**Echinoidea** (Gr. *echinos*, hedgehog; *eidos*, form). Order of echinodermata containing the sea-urchins. They include regular urchins of which the somewhat spherical common sea-urchin (*Echinus esculentus*, of rocky British coasts is a familiar example; the oval heart-urchins (e.g. *Echinocardium*) of the sandy shores; and the depressed cake-urchins (*Clypeaster*), which are not represented in British waters.

The common sea-urchin has beneath its coat of about 4,000 bristling spines a thin stony box composed of nearly 600 five-sided plates, placed edge to edge. Through the minute perforations issue the delicate sucker tubes of the ambulacral system (see Echinodermata). Some of the plates bear polished bosses upon which the spines turn in any direction. Each tapering spine has a polished cup at its base to receive the boss, and the two are held together by muscular tissue. Among the spines will be found stalked and sessile organs resembling the bills of birds, which have the power of snapping; these are called pedicellariae. Around the Mediterranean the sea-urchin is esteemed as food; hence its name *esculentus*. The gonads are edible and a rich source of vitamin A.

The heart-urchins, which burrow in muddy sand, are clothed with silky bristles, all pointing backwards. The scoop-like mouth is at the broad end and without teeth.

**Echmiadzin.** A monastery in Armenia S.S.R. It stands 12 m. W. of Erivan and 40 m. N. of Mt. Ararat. Its foundation is attributed to S. Gregory the Illuminator in 302, and since 1441 it has

been the patriarchal seat of the Armenian Church. Many tombs, relics, and manuscripts are shown. The neighbouring town is Vagarsapat, but Echmiadzin has given its name to an administrative district.

**Echo.** A sound caused by reflection of sound from a suitable surface such as a wall or rock-face. It may be heard quite distinctly from the direct sound if the observer is suitably placed with respect to the source and the reflecting surface. The rolling of thunder is due to numerous successive reflections between surfaces of clouds.

**Echo.** In Greek mythology, a mountain nymph. At one time the companion of Hera, having displeased the goddess, she was punished by being rendered incapable of speaking except when spoken to. Subsequently Echo fell in love with the beautiful Narcissus, but, her love not being returned, she pined away and was changed into a stone which retained the echo or answering voice.

**Echo Sounding.** Electro-sonic method whereby ships take automatic soundings of the sea bed over which they are passing. First developed during the First Great War for detecting the presence of enemy submarines, the echo sounder was used instead of the lead with which mariners used to estimate depths of water.

By the opening and shutting of a control switch, an electrical current is passed from a charged condenser through the windings of a transmitter and causes a sound impulse to be emitted. This impulse is reflected, or echoed, back from the sea bed or any obstacle in its path and picked up by the receiving portion of the instrument. After being amplified, the sound impulse actuates a stylus which records, on a revolving strip of sensitised paper, marks proportional to the time taken for the echo to return from its source to the instrument. The number of echoes received ranges from 75 to 400 a minute, according to the instrument.

As the rate at which an echo travels through water is known, it is possible to calculate with fine accuracy the depth of the object returning the echo. The stylus moves to the right or left of a central line on the paper, and its successive marks form a continuous contour or graph. This graph shows the smallest variation of water depth, and gives an indication of the character of the sea

bed; the thicker the line on the paper, the harder the bottom. The echo sounder is equally responsive in deep or shallow water.

Most large liners are fitted with echo sounders, as are colliers bringing coal to the power stations and gasworks on the banks of the Thames. Many trawlers carry echo sounders to detect the presence of shoals of fish, or any obstacles that might destroy nets. Whaling factory ships use echo sounders that will respond to a whale two miles away. The instrument was used to survey the bottom of the English Channel preparatory to laying the oil pipe line (*see* Pluto) between England and France in 1944.

Detectors making use of the sonic principle have been applied to industry for detecting flaws in metal castings. The instrument transmits ultrasonic pulses into the metal under test and measures the time it takes the pulses to travel through the material, reflect from the opposite side or from a defect, and return to the point of origin. Ultrasonic waves travel best in solids and, as they weaken when in contact with air, register on a meter when they strike an air hollow or flaw in a metal casting.

**Echternach.** Town of Luxembourg. It stands on the Sure, near the frontier of Prussia, and is famous for its annual festival and its association with S. Willibrord. In the church, a Romanesque building of the 11th century, restored in the 19th, were the remains of the saint. There was a rich Benedictine abbey here until 1801. The festival, which dates from 1300 or earlier, is held every Whit Tuesday. It is attended by pilgrims and invalids, as well as high ecclesiastics, who are accompanied by a singing and dancing crowd as they go in procession to the church. Echternach had a town hall and some small industries.

Southernmost point at the base of German penetration in the Ardennes counter-offensive, Dec., 1944-Jan., 1945, Echternach changed hands more than once during hard fighting, but the stubborn American defence prevented the enemy from overrunning it and extending his advance southwards.

**Echuca** (formerly Hopwood's Ferry). Town of Victoria, Australia. It stands on the Murray river, 156 m. by rly. N. of Melbourne. It is the chief river port on the Murray at its junction

with the Campaspe. A bridge (rail and road) 1,905 ft. in length spans the river here, connecting with Moama in New South Wales. Echuca is the outlet for the wine, wool, and timber of this district. A rly. line 45 m. long to Deniliquin, on the Edward river, taps part of the N.S.W. Riverina trade; and Echuca is also connected with Bendigo. Pop. est. 4,480.

**Écija** (anc. *Astigi*). Town of Spain, in the prov. of Seville. It stands on the Genil, here crossed by an old bridge, 34 m. by rly. S.W. of Cordova. Écija, once a Roman colony (Julia Augusta Firma) and a Moorish town, retains many traces of ancient civilization. It now manufactures boots and shoes, soap, pottery, and textiles. The surrounding fertile plain produces corn, cotton, and olives; the vine is largely cultivated, and a fine wine is made. From its climate Écija is popularly called the *Frying-pan* of Andalusia. Pop. 30,560.

**Eck, JOHANN MAJER VON** (1486-1543). German theologian. He was born at Eck, in Swabia, Nov. 13, 1486, his father's name being Maier. Having studied at Heidelberg, Tübingen, and elsewhere, he was ordained priest in 1508. Two years later he became professor of theology at Ingolstadt university, with which he was associated for the rest of his life. The ablest opponent of the Reformation in Germany, in June-July, 1519, he debated publicly at Leipzig with Luther and Carlstadt, then wrote a treatise on the Primacy of Peter, and went to Rome. He returned with the papal bull excommunicating Luther (*q.v.*). Eck organized the Catholic Federation, and took a prominent part in successive conferences and diets at Ratisbon, 1524; Baden, 1526; Augsburg, 1530; and Worms, 1540. His German version of the Bible was published in 1537. He died Feb. 13, 1543.

**Eckener, Hugo** (b. 1868). German engineer and airman. Born at Flensburg, Aug. 10, 1868, he was at one time a mathematician, economist, and psychologist, and later assisted Count Zeppelin in building airships. In 1908 he became Zeppelin's deputy and in 1911 his successor. During the



Hugo Eckener,  
German engineer and  
airman

First Great War and after, Eckener continued to design and pilot Zeppelin airships. He designed the Graf Zeppelin (*q.v.*), piloting it round the world in 1929, and in 1931 flew over the North Pole. A staunch democrat, he was, after the defeat of Germany in 1945, invited by the French occupation authorities of the Lake Constance area to play a political rôle; and edited the most important daily paper of that area, *Süd Kurier*.

**Eckermann, JOHANN PETER** (1792-1854). German writer. He was born at Winsen, Hanover, Sept. 21, 1792. After early hardships he served in the war of 1813-14, and later studied at Göttingen. In 1822 he sent Goethe the MS. of his *Beiträge zur Poesie*, and this resulted in his going to Weimar, where he acted as secretary to Goethe, and assisted in the preparation of the final edition of his writings. Eckerman is best remembered by his *Gespräche mit Goethe* (1836-48), Eng. trans. John Oxenford, 1850. He died at Weimar, Dec. 3, 1854.

**Eckhart, JOHANNES** (c. 1260-1327). German mystic and theologian. Born at Hochheim, near Gotha, he became a Dominican friar, and in 1298 was prior of Erfurt and provincial of Thuringia. In 1300 he was lecturer in Paris, and in 1307 he was vicar-general of Bohemia and provincial of Saxony. He was subsequently lecturer at Paris, Strasbourg, and Frankfurt, and from 1320 until his death was professor at Cologne. Certain expressions used by Eckhart were condemned as heretical, and he was suspected of pantheism. But he made complete repudiation of error and submission to Rome.

Eckhart, who is known as the Master, was the founder of German mysticism. His writings do not present a definite system of philosophy, and his teaching is mainly concerned with the Divine essence in all things, the relation of the human soul to God, and the attainment of God by casting off all that hinders knowledge of God. No complete English trans. of his works exists. *Consult* *Deutsche Mystiker des 14 Jahrhunderts*, ed. F. Pfeiffer, 2nd ed. 1907.

**Eckington.** Parish and town of Derbyshire, England. It stands on the Rother,  $6\frac{1}{2}$  m. S.E. of Sheffield, with a rly. station. Agricultural implements are manufactured, and there are coal mines in the neighbourhood. Market day, Fri. Pop. 15,000. Another

Eckington, in Worcestershire, is close to the Avon and Bredon Hill.

**Eckmühl, BATTLE OF.** Victory of Napoleon over the Austrians, April 22, 1809. In an attempt to reopen his communications, which had been broken by the French, the archduke Charles emerged from Ratisbon to give battle. His troops were routed by Davout and Oudinot, and the whole Austrian army was demoralised and forced across the Danube. For his part in the day's success Davout was created prince of Eckmühl.

**Eclampsia.** Term applied to a condition in which convulsions occur before, during, or after childbirth. These convulsions are due to failure of the maternal kidneys to excrete the toxic load of the mother and foetus. The condition can be diagnosed at its onset by a rise in blood pressure and by presence of albumen in the urine. The careful obstetrician records the blood pressure of the pregnant woman and examines the urine for albumen as routine measures. Should the blood pressure rise, and should albumen make its appearance, the treatment is complete rest, a diet of water and vegetables, and hourly observation of the case. Termination of the pregnancy by induction of labour or by caesarian section may be necessary.

**Eclecticism** (Gr. *eklektikos*, picking out). In philosophy, a method which, while not excluding independent thought, selects and works up into a whole what is acceptable in other philosophical systems.

The most important Greek representative of this practice, which first made its appearance in the Stoic school, was Antiochus of Ascalon (1st century B.C.), the head of the so-called Fifth Academy, whose teaching led to the adoption of eclecticism by the Academy in place of scepticism as

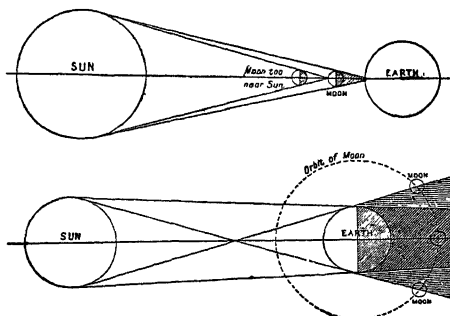
its ruling principle. Among the Romans, Cicero, who attended his lectures at Athens, although by no means an original thinker, skilfully selected and combined Sceptic, Stoic, and Peripatetic doctrines. Among modern eclectics Leibniz and Victor Cousin may be specially mentioned.

**Eclipse** (Gr. *ekleipsis*, failing to appear). In astronomy, the temporary interruption of the light from a celestial body. Eclipses fall into two classes: (1) If the eclipsed object is self-luminous, an eclipse will occur if a dark body is interposed between it and the earth. The best example of this is an eclipse of the sun, when part of the earth's surface is covered by the moon's shadow. A similar phenomenon occurs when the orbit of a binary star (*q.v.*) lies edge-on to the earth. (2) If the eclipsed body shines by reflected light, an eclipse will occur if a dark body comes between it and the source of light. An eclipse of the moon is of this type, the moon passing into the shadow cast by the earth. Eclipses of planetary satellites (*e.g.* the moons of Jupiter) by their parent bodies also fall into this class.

If the earth, the sun, and the moon moved in the same plane, there would be an eclipse each time the three were in a straight line. Since, however, the moon moves in an orbit inclined at an angle of  $5^{\circ} 8'$  to the plane of the sun's path, the ecliptic (*q.v.*), there can be an eclipse only when the moon is crossing the plane of the ecliptic. The points where the moon crosses the ecliptic are called the nodes, and when new moon happens at one of these nodes there will be an eclipse of the sun. When full moon occurs at one of the nodes the earth is between the moon and the sun, and there will be an eclipse of the moon by the earth's shadow.

An eclipse of the moon will be visible to the whole side of the earth turned away from the sun. But in a solar eclipse the moon casts only a restricted shadow on the earth, and therefore the sun will appear in total eclipse only in the narrow path of this moving shadow.

Owing to the refraction of the



Eclipse. Diagram showing the phases of an eclipse of the sun by the shadow of the earth. Top, eclipse of the sun by the moon. When the moon is too near the sun there is an annular eclipse

sun's rays by the earth's atmosphere into the geometrical shadow, the moon is hardly ever quite swallowed up in blackness. A total lunar eclipse may last about 1 hour 45 minutes. If the moon is not exactly at the node at its eclipse a partial eclipse will result, the lower or the upper limb of the moon being obscured by the umbra, or darker portion of the earth's shadow.

In a total eclipse of the sun by the moon the diameter of the moon's shadow cast on the earth averages only about 150 m. and sweeps across the earth from W. to E. with great rapidity. The eclipse can be visible only in places swept by the shadow, and the longest time the total eclipse of the sun by the moon can be visible at any place is a little more than seven minutes.

Partial eclipses occur when the new moon is not quite at the node; annular or disk-like eclipses are due to the fact that the moon is sometimes too far from the earth to hide the sun entirely from the view of an observer on the earth. The length of the cone of the moon's shadow varies with the moon's distance from the sun between 228,000 and 236,000 m. The moon is sometimes as near as 221,700 m. to the earth, and sometimes 252,400 m. away, so causing the variation both in the appearance and the length of time of solar eclipses.

The maximum possible number of eclipses of the sun and the moon in any one year is seven. This happened in 1935 and will not occur again for two centuries. The minimum is two (both solar). Although there is no actual connexion between one eclipse of the sun or moon and the one immediately following, there is a cycle, known as the Saros, of a little over 18 years of eclipses, and it was owing to a knowledge of this fact that the ancients were able to predict eclipses of the moon, though since eclipses of the sun are very rare at any given place on the earth's surface, the similar sun cycle was overlooked.

Eclipses of the sun have been fruitful in discovery, for only when the bright disk is covered can the sun's atmosphere be effectively studied. The eclipse of 1868 resulted in the discovery of helium in the sun, 27 years before it was found to be a constituent of one of the rare earths, cleveite. The eclipse of 1919 provided an opportunity to prove Einstein's generalised theory of relativity by show-

ing that light was attracted by the sun and deflected from a straight path.

As a total solar eclipse occurs only over a limited track on the earth's surface, astronomers make expeditions with portable equipment to study it. Total lunar eclipses can be seen over half the earth but are of little scientific interest. The last total solar eclipse visible in Great Britain was on June 29, 1927, when a Greenwich expedition studied it from Giggleswick, Yorks; the next will be on Aug. 11, 1999, visible in Cornwall. See Corona; Ecliptic; Moon; Occultation; Sun; Consult also Eclipses of the Sun and Moon, Sir F. Dyson and R. Woolley, 1937.

**Eclipse.** English racehorse, regarded as the greatest that has ever lived. Foaled April 1, 1764, he was named because on that day there was an eclipse of the sun. He ran in his first race May 3, 1769, and from then until Oct., 1770, ran in 18 races, never being beaten. He was bred by the duke of Cumberland, but at the time of his successes was the property of D. O'Kelly. After 1770 he was used for stud purposes. The horse's skeleton was placed in the Royal Veterinary College, Camden Town.

**Eclipse Stakes.** Race for horses of 3 years and upwards run at Sandown Park over a distance of 1½ m. It was inaugurated in 1884 and formed the first of the £10,000 races. Danny Maher rode the winner of this event on five occasions. One of the most popular wins was that of Orme, after recovering from his supposed poisoning, in 1892. See Horse Racing.

**Ecliptic** (Gr. *ekleiptikos*, relating to an eclipse). Track in the heavens along which the sun appears to move backwards amongst the stars in the course of a year; so called because the moon must be on this great circle if an eclipse is to occur. The sun's motion is only apparent; it is the motion of the earth about the sun which produces the appearance of the sun's itinerary. The plane of the ecliptic is the plane of the sun's apparent, and of the earth's real, motion. The obliquity of the ecliptic is the angle ( $23\frac{1}{2}^\circ$ ) the ecliptic makes with the celestial equator. Since the orbits of the moon and planets are nearly co-planar with the earth's, all these bodies in their wanderings stay close to the ecliptic. The celestial zone containing the ecliptic is the zodiac. See Sun; Zodiac.

**Eclogite** (Gr. *eklogos*, picked out). Crystalline metamorphic rock having the same general com-

position as gabbro or basalt, from which it may have been derived by heat and pressure. When freshly broken it presents a beautiful appearance due to red garnets in a green matrix of omphacite (pyroxene) and smaragdite (amphibole). It occurs in irregular masses in schists; some geologists think it forms an irregular layer in the earth below the crust.

**Eclogue** (Gr. *eklogē*, selection). Pastoral poem relating the lives and loves of shepherds. Properly almost identical with the idyll, the term is generally restricted to pastoral poems in dialogue form, such as the *Bucolics* of Virgil. Spenser set the fashion anew with his *Shepherds Calendar*, and the form was common in the artificial poetry of the 17th and 18th centuries. The name has sometimes been used for dialogue poems other than pastoral, as in Phineas Fletcher's *Piscatory Eclogues* (1633) and John Davidson's *Fleet Street Eclogues* (1893-96).

**Encomus.** Headland on the S. coast of Sicily, between Agrigento and Licata. Off here in 256 B.C. the Romans under Regulus utterly defeated the Carthaginian fleet.

**École des Femmes, L'** (The School for Wives). Five-act comedy by Molière, first produced at the Palais-Royal, Paris, Dec. 26, 1662. The scene is in Paris. A selfish, middle-aged bachelor, Arnolphe, brings up a young girl, Agnes, to make her his wife, keeping her ignorant of the world; but fails to prevent her from falling in love with Horace, a son of his old friend Oronte. Unaware of Arnolphe's relation to Agnes, Horace reveals to Arnolphe his love story. The lovers do not meet before the audience until the last act. Molière acted the part of Arnolphe.

**École des Maris, L'** (The School for Husbands). Three-act comedy by Molière, first produced at the Palais-Royal, Paris, June 24, 1661. The theme of two brothers, Ariste and Sganarelle, in charge of two wards, sisters, whom they desire to marry, was suggested by The *Adelphi* of Terence. Ariste is generous as Sganarelle is mean and masterful. Molière acted the part of the latter. The scene of the play is laid in the French capital.

**Ecology** (Gr. *oikos*, house, *logos*, discourse). The study of living things in their natural surroundings. It shows that particular organisms are normally to be found in certain habitats, and hence leads to the view that the conditions in the habitats are suitable for their life. The



conditions, or ecological factors, resolve themselves into a purely physical group such as temperature, humidity, light intensity, and kind of soil; and a biotic group, due to the activity of organisms, such as the effect of grazing, shading, availability of organic food. Organisms living under particular sets of conditions constitute communities of which various categories are recognized. The clan is formed of members of one species; the society and the association of more than one. In mixed communities one or more types dominate.

Organisms often modify the environment in which they live and so render it more favourable to less prosperous inhabitants or for the establishment of invaders. Either will then augment the competition within the community, and prosperous species may suffer, even to the point of suppression. Alternatively changes in communities may be caused by factors originating from without. Ultimately in any succession there is produced a community with innate equilibrium, consisting of organisms best suited to the environment with a limited number of dominant species so constituted that they prevent others attaining a higher degree of importance. Consult *The Ecology of Animals*, C. Elton, 1933. *Animal Ecology*, A. S. Pearse, 1939; *The British Islands and their Vegetation*, A. G. Tansley, 1939.

**Economic Man.** Term used to describe man as discussed in the works of Ricardo. John Stuart Mill, and other political economists. He is a person who is actuated solely by material interests, who judges every transaction by the loss or gain afforded to him. Later writers have emphasised the fact that man is not actuated solely by material considerations, and have disputed the existence of economic man.

In the mass and in the long run men tend to act along certain well-defined lines, e.g. they tend to stop production which does not pay. Hence it is useful to conceive an average man whose family is of average size, whose needs are satisfied in an average way, whose work yields an average return, and so on. Such an imaginary economic man provides a ready standard of comparison. Just as the mathematician needs the perfect circle which does not really exist, so the political economist postulates an economic man for the study of his science. See *Economics*.

## ECONOMICS: THE STUDY OF COMMERCE

F. C. C. Benham, Prof. of Commerce, University of London

*A description of the field of man's activities—namely, the satisfaction through commerce of his needs of food, clothing, housing, and occupation—with which economics deals, and of how it formulates explanations of the changing conditions within that field*

The main purpose of economic activity is to satisfy the wants of people for food, clothing, housing, and all the other commodities and services which they consume and which constitute their standard of living. The central economic problem for any community is how to make the best use of its labour and resources. All wants cannot be completely satisfied. The problem is to satisfy them as fully as possible from the means of production available. These means of production—labour, land, and capital (physical assets)—are limited in amount. Many of them are capable of alternative uses. Youths and girls can enter any one of a number of occupations, some workers can move from one industry to another; some land can grow any one of several crops or can be used for pasture, or for building sites; and many buildings and machines can serve any one of several purposes. The community must, therefore, choose what assortment of goods and services shall be produced out of the infinite number of assortments which it could produce. Hence Professor Robbins, in *The Nature and Significance of Economic Science*, has defined economics as "the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses."

### Methods of Organization

One method of dealing with this problem is by complete central planning, as in Soviet Russia. A good deal has been written on the merits and defects of this form of social organization. But most countries retain the institutions of private property, freedom of enterprise, and freedom of choice by consumers, all subject to greater or less control by the state. Hence most economists writing in English assume the more common framework of social institutions.

Under these conditions, the problem is solved mainly through the price-system. A large part of economic analysis deals with the formation of prices, and the relations between prices: in other words, with the theory of value and its applications. Everything which can be exchanged for money has a price: for example, wage rates in different occupations and

rates of interest are prices, and form part of the price system. The price of a commodity or service tends to equate the demand for it (the amount which buyers are willing to take at that price) with the supply of it (the amount which sellers are willing to sell at that price). Demand reflects the preferences of consumers and the relative spending power of different consumers; supply reflects the relative scarcities of the various commodities and services. The demand for means, or factors, of production is derived from the demand for the commodities and services which they help to produce. In the absence of monopoly, the price of a factor tends to equal the value of the addition which an extra unit of that factor would make to output (known as its marginal product) and the price of a commodity tends to equal the extra money cost of producing a further unit (known as its marginal cost).

### How the Price System Works

In the absence of monopoly, therefore, the central economic problem would be met in the following way. An increase in the demand for a commodity would tend to raise its price; that industry would become a specially attractive field for investment; labour and other factors of production would be directed towards that industry, where they could now earn more; and so more of that commodity would be produced in response to the increased preference for it of consumers. An increase in the supply of a commodity, due perhaps to a big harvest or to an invention which reduces costs of production, or to the movement of labour and capital to an industry in excess of the limits of demand at a high price, tends to reduce its price and thereby to expand its sales. Conversely with decreases in demand or supply. Costs represent alternatives forgone, for they are sums of money paid to attract factors away from other industries, where they could contribute (nearly) the same value to output.

But the price system does not work perfectly. While 19th century industrialists considered it good policy to make a small profit on a

great many items, in the 20th century it was found to pay a monopolist deliberately to keep down output in his field in order to raise prices and increase profit on each item. Economics studies these phenomena of monopoly and imperfect competition, associated with trade marks and advertising. It is generally agreed that the state should supplement the price system by preventing or controlling monopoly and by paying for services such as defence and public health and education which private enterprise would not provide adequately.

Economic activity under free enterprise has large swings up (booms) and down (slumps); mass unemployment often occurs during the slumps. Hence economics studies the nature and causes of this "trade cycle" to discover whether general economic depressions, or slumps, can be avoided.

An important contribution to economic theory in general, and especially to this branch of it, was made by J. M. Keynes (Lord Keynes) who published in 1936 *The General Theory of Employment, Interest, and Money*. He showed that if people spent less, in order to save more, this tended to create unemployment unless it was offset by increased expenditure on "capital goods" such as buildings, ships, plant, and machinery. Much has been written, largely inspired by this book, on methods of preventing mass unemployment. Suggestions include public works, control of investment, and deliberate budget deficits when slumps threaten.

#### Fluctuating Value of Money

Industry and trade on the modern scale would not be possible without the use of money. Money is a generally acceptable purchasing power. A man will take it in exchange for his goods and services because he knows that others in turn will take it from him in payment for what he wants to buy. The purchasing power of the monetary unit may change from time to time. If it falls (in other words, if the general level of prices rises), this hits people on fixed incomes and creditors due to receive fixed sums of money, for the money buys less than it used to do. On the other hand, the prospects of a rising price level often stimulate borrowing and economic activity, although sometimes firms embark on enterprises which do not survive after prices cease to rise. The theory of money and banking deals with

these questions, and also how changes in the amount of money and in the desires of people to hold money rather than income yielding securities ("liquidity-preference") may affect the rate of interest.

The theory of international trade explains why a country specialises in the production of certain commodities which it exports in exchange for others, which it imports; and discusses "the terms of trade"—what forces determine the volume of imports a country gets in exchange for a unit of exports. A country also engages in other transactions with the rest of the world. It may receive payments as interest or profits on its foreign investments, or for shipping and other services which it renders, or from tourists. All the various payments which it makes and receives together form its balance of payments. Equality between its payments and receipts can be attained in various ways. These include changes in the rate of exchange between its currency and other currencies; restrictions on imports and subsidies on exports; and, under fixed exchange rates, inflation or deflation of the national money income. The money income of a person for a year is his total receipts, including the value of any items such as farm produce which he produces for his own consumption, less his business expenses. The national income for a year is the net sum total of all incomes of persons, firms, and institutions for that year. It must be measured net. For example, dividends paid by companies must not be counted in the incomes of the companies as well as in the incomes of the shareholders; income tax must not be counted in the incomes of both the taxpayers and the government.

#### How to Assess National Income

The national income of a country is the best single measure of its economic position, but for comparison with other years or with other countries allowance should usually be made for differences in population and in the purchasing power of money. The latter allowance can be made by taking some year as the "base" year and then altering the money figures for other years to make them represent money units of the same purchasing power as in the "base" year. The result gives a comparison of "real," as opposed to "money," income. For example, if in the year 2000 the

price level should be twice as high as in 1950 (taken as the base year) the actual national income of 2000 should be divided by two in order to compare it with that of 1950.

The main determinant of real income is the volume of production. This is influenced by many factors. These include the natural and acquired capacities of the people, and the natural resources and other assets (the size of the population relative to these resources, the amount of specialisation, and the state of technical knowledge) of a country. Part of the economic activity of a country is devoted to providing for the future by increasing productive equipment, and improving health and knowledge; this investment keeps down current consumption, but tends to increase future output.

#### Increase of Technical Knowledge

The great economic progress which has taken place in the western world over the last hundred years or more has been due to the continued growth of technical knowledge combined with increased investment and greater specialisation, including large-scale production. But technical progress may be offset by over population, by wars, or by natural catastrophes.

The study of economics is an aid to clear thinking and is useful to the citizen as well as to the statesman. Economists do not always agree among themselves on practical issues. This is usually for one or both of two reasons. In the first place, these issues may involve personal judgements about the extent to which one aim (for example, greater output) should be sacrificed to another aim (for example, greater equality or social security). In the second place, they usually involve forecasts about how people would respond to the proposed measures. But the citizen should know enough economics to form his own judgements on these issues of policy.

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**Economics and Political Science**, LONDON SCHOOL OF. College of the university of London founded in 1895 for the study of the social sciences. Among the subjects for which teaching is provided for undergraduate and post-graduate students are economics, banking and currency, commerce, transport anthropology, colonial administration, history, law, geography, political science, statistics, social science, criminology, international relations, and sociology. This is one of the most important centres in the U.K. for research in the social sciences; its library is the biggest of its kind in Europe. The school is in Houghton Street, Aldwych, London, W.C.2.

**Economic Warfare**. Engendering paralysis of the enemy's war machinery by depriving it of materials. Great Britain's economic warfare against the Axis powers, 1939-45, was conducted by a ministry (*v.i.*) whose function was to starve the enemy of raw materials for munitions, oil, grain, fats, cotton, and every imported commodity that might be useful. A blockade was instituted and a number of contraband control stations established, at which neutral ships were searched for contraband cargo. Exports from Germany were also blockaded. A form of passport, called a *navicert* (*g.v.*), was issued at the port of shipment to cover legitimate cargoes.

A secondary arm of economic warfare was the purchasing of supplies in neutral countries to prevent their going to enemy countries. Some targets bombed by the R.A.F. were selected by the ministry, especially dams, transport centres, synthetic rubber plants, and oil refineries. Examination by experts of material captured on the battlefield revealed certain shortages in enemy countries and suggested where such air attacks might prove most effective.

Another method of tightening controls of enemy imports and exports was the use of black lists; lists of persons and firms, chiefly in neutral countries, known to be cooperating with the enemy. No *navicerts* or export licences were issued to anyone on these lists, or suspected of acting for black-listed firms. See *Black List*; *Blockade*.

**Economic Warfare, MINISTRY OF**. Department of the British government during the Second Great War. It was formed on Sept. 3, 1939, the first minister being R. H. Cross, and had tasks

analogous to those of the ministry of Blockade set up during the First Great War, namely, to disorganize the economic life of the enemy in order to reduce his capacity for waging war. The ministry was dissolved in May, 1945, its functions in the Far East being undertaken by the Foreign office.

**Economiser**. Extension of the feed water pipe-line of a steam boiler, comprising a nest of tubes placed in the flue gas exit to utilise waste heat by additional heating of already warmed feed water. The water should be preheated to 120° F. to prevent undue cooling of the flue gas, as condensation of moisture in a highly sulphurous atmosphere would cause severe external wastage of the tubes. The preheater may use exhaust or live steam, or heated feed water may be by-passed back to mingle with the incoming cold water. An economiser also provides a reserve of hot feed water against peak load demands, and helps to reduce scale formation in the boiler by receiving the bulk of the sludge precipitated from temporary hardness. The outsides of the tubes are cleaned by steam-jet soot blowers, or mechanically operated scrapers. Saving in fuel may amount to 10 p.c.

**Economist, THE**. A London weekly paper devoted to political economy. It was founded in 1843 by James Wilson, who edited it until 1859, Herbert Spencer being sub-editor, 1848-53. During 1859-77 the paper was edited by Walter Bagehot; 1907-16 by Francis W. Hirst; 1922-38 by Sir Walter Layton, who was succeeded by Geoffrey Crowther. It has always discussed financial questions from a social and economic standpoint, and in its early days was a staunch advocate of free trade and the repeal of the Corn Laws.

**E.C. Powder**. One of the oldest British smokeless powders for use in sporting guns. Invented in 1882 at the works of the Explosives Company, hence E.C., at Stowmarket, it consisted essentially of nitro-cellulose mixed with nitrates and moderants. The powder is prepared in granular form suitable for loading. It is a 33-grain powder, *i.e.* 33 grains of the smokeless powder is equivalent to the old standard charge of 82 grains of gunpowder.

**Écrins**, BARRE DES Mt. of S.E. France. It is the highest summit of the Pelvoux group of the Cottian Alps, which lie between the depts. of Hautes-Alpes and Isère. Alt. 13,460 ft.

**Ecstasy** (Gr. *ecstasis*, displacement, trance). A name given to various states of consciousness, in which, the mind being concentrated on a definite object, the senses are temporarily inactive, and external sensations inoperative. It has been experienced at various times by many Christian mystics, notably by S. Teresa, and valued as a supernatural phenomenon. According to their own testimony the mystics have received, in ecstatic condition, special manifestations of the will of God. The term is also sometimes applied to the abnormal mental conditions of catalepsy, the hypnotic trance, somnambulism, and to the trances of spirit mediums. The chief points distinguishing these states from ecstasy are the absence of consciousness and of all memory of what has taken place during the trance. See *Dreams*.

**Ectoderm** (Gr. *ectos*, outside; *derma*, skin). Term applied to the outer layer of the embryo, from which the skin and nervous system of a vertebrate animal originate. It is also used for the outer layer of cells in the Coelenterata. See *Embryology*.

**Ectopic Gestation** OR EXTRA-UTERINE PREGNANCY (Gr. *ectopos*, out of place). Condition in which the fertilised ovum, or egg cell, instead of developing within the uterus, becomes implanted in the Fallopian tube which leads to the uterus, or escapes into the body cavity and there begins to develop. It is rare in young women, and is most often seen in women who have been married for a number of years without having had a child, or where a long time has elapsed since the last pregnancy. Any inflammation affecting the tubes is a predisposing cause, narrowing the lumen of the tube or interfering with the movements of the delicate ciliae (minute processes of the lining mucous membrane) which with a wave-like movement normally propel the fertilised ovum towards the uterus.

The symptoms are not very definite, but some signs of pregnancy may be present. When irregular bleeding or recurring colic-like pains occur, coupled with the possibility of pregnancy, a medical opinion should be sought. Often, however, the first indication is a sudden attack of acute pain with collapse, and signs of internal haemorrhage, due to rupture of the sac of the developing embryo. In most cases immediate operative treatment provides the best hope of saving life. See *Pregnancy*.

**Ectoplasm** (Gr. *ektos*, outside; *plasma*, something moulded). The outer layer of a non-cellular animal, such as amoeba, and apparently usually in the gel state, i.e. relatively stiff. It can undergo a reversible thixotropic change to the sol condition in which it flows. It acts as a semi-permeable membrane and permits the ingress and egress of molecules during the metabolism of the animal. Spiritualists use the term ectoplasm for an apparent vaporous materialisation occurring during the trance of the medium.

**Ectozoa** (Gr. *ektos*, outside; *zōon*, animal). Term applied to parasites which live on the exterior of their hosts, in contrast with the entozoa, which live in the internal organs. Lice and ticks are examples of the ectozoa, tape worms and flukes of the entozoa.

**Écu** (Fr., shield; Lat. *scutum*). Obsolete French silver coin. First struck by Louis IX, its value was three livres. Charles VI issued, in 1384, a piece known as *écu de la couronne*, the *écu* being called in England a crown. There was also minted a double silver *écu* of six livres, worth about 5s. See Crown.

**Ecuador.** Republic of South America, lying between Colombia on the N. and Peru on the S. It is

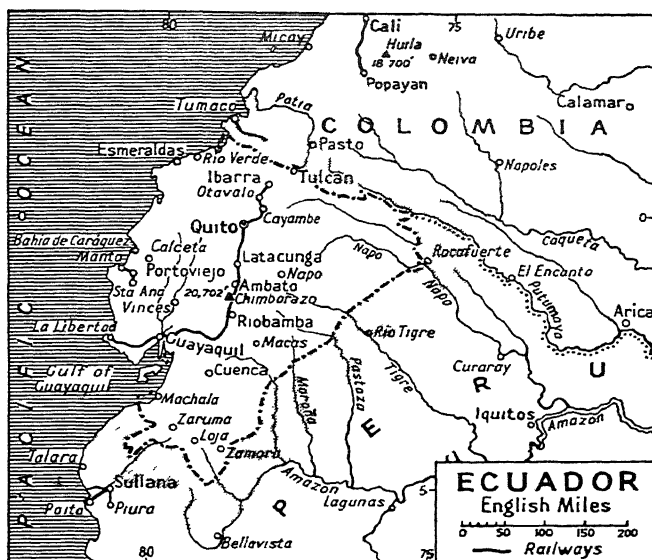
so named because the equatorial line runs through the country. Its western shores, 500 m. in extent, are washed by the Pacific Ocean. The Colombian boundary was



Ecuador arms

settled by treaty in 1917, and the Peruvian frontier was agreed upon in Jan., 1942. The republic embraces the provinces of Azuay, Bolívar, Cañar, Carchi, Chimborazo, Cotopaxi, Esmeraldas, Guayas, Imbabura, Loja, Manabí, Napo, Pastaza, El Oro, Pichincha, Los Rios, Santiago Zamora, Tungurahua, and the Galápagos archipelago. Its area is not known even approximately; there are estimates of 176,000 and 276,000 sq. m. A large area was lost by the boundary revision of 1942. The pop. is estimated at 3,100,000, over half being of mixed blood and 27 p.c. Indian.

The dominant geographical feature is the gigantic mountain system which traverses the land from N. to S. Two towering mountain ramparts, the Eastern and Western Cordilleras, run parallel to each other, enclosing a broad elevated valley, 20-50 m. wide, and



Ecuador. Map of the South American republic which lies between Colombia and Peru; the frontiers shown are those of the 1942 revision

8,000-10,000 ft. above sea level. This trough is walled on either side by the famous "avenue of volcanoes," above a score of peaks in a double line, most of them rising far above the snow line. No fewer than 20 of these summits can be counted from Quito, the capital, which stands on the central plateau at a height of 8,400 ft. The volcano of Pichincha (about 15,910 ft.) is notable for its perilous proximity to the capital; but more conspicuous is the perfectly symmetrical and dazzling cone of Cotopaxi (19,613 ft.). Higher yet soars the imposing snow-clad mass of Chimborazo (20,702 ft.). Above the snows, volcanic craters emit their clouds and ashes. Eruptions have been frequent since records began with the coming of the Spaniards, and the whole region is subject to earthquake shocks. The region presents an endless variety of altitude and climate: torrid, forest-clad plains bordering the lower spurs; temperate, pleasant, and productive valleys; cool regions of the lofty plateau; páramos, or icy, wind-swept plains and slopes, approaching the limit of perpetual snow.

Although the mountains predominate, the greater part of Ecuador lies in the forest-clad plains which stretch to E. and W. from the foot of the two Cordilleras. In fact, Ecuador has three distinct zones: the coastal plain, the Andine mountain system, and the *montaña*, the densely wooded region stretching into the

interior from the base of the Eastern Cordillera, and intersected by the multitudinous upper waters of Amazonian affluents.

The most valuable and productive part of the country is the broad coastal plain, richly tropical and humid in character. This plain, watered by innumerable streams and originally covered by dense forests, supports the extensive plantations of cacao, which supply the chief export, besides plantations of bananas and other tropical products. Numerous streams, particularly those connected with the port of Guayaquil, provide access to the cacao plantations. The forest is valuable for its thickets of bamboo, dyewoods, cinchona, balsa trees, and many kinds of palms, besides the palm-like plant whose fibre is woven into Panama hats.

Through the towering wall of the Western Cordillera, lofty passes lead to the Andine plateau. From this plateau steep and difficult mountain passes lead eastwards, up between the peaks of the Eastern Cordillera, and then down along twisted and precipitous river valleys to the *montaña*, where scanty tribes of savage Indians support life by hunting with the blow-pipe and with poisoned arrows. This most inaccessible region resembles the forests of Brazil; its woods and waters are haunted by a multitude of reptiles, saurians, fishes, birds, and insects. Trees, lianas, flowering shrubs, and gaudy orchids occur. The mammals

include jaguars, pumas, tapirs, sloths, bears, deer, armadillos.

The volcanic group of the Galápagos Islands lies on the Equator, 695 m. from the W. coast, and covers 2,868 sq. m. Named from the gigantic tortoise (galápagos) found on the islands, they are remarkable for the fact that about half the indigenous plants, all the reptiles, and nearly all the birds are peculiar to this archipelago. In the 17th and 18th centuries the islands, at that time uninhabited, were the resort of buccaneers.

**PEOPLE, LANGUAGE, ETC.** The population is descended partly from Spanish settlers, partly from indigenous Indians, and in a less degree from negro slaves. Most of the Indians and mixed types are simple and ignorant; they perform all the manual labour, and bear with customary apathetic submission the domination of the ruling class. These peasants and labourers are virtually devoid of any sense of nationality or citizenship and indifferent to forms or methods of government, although they have been swept into contending armies, in numerous civil wars, by *caudillos* on either side. More than 50 p.c. of the pop. is pure-blooded Indian, 25 p.c. mixed Spanish and Indian, 15 p.c. negro, and the remainder is of pure Spanish descent. The dominant class, which forms a society of typically S. American culture, is of mixed blood. The official language, and the tongue in general use, is Spanish. Quichua is spoken by several Indian tribes in the N.

**CONSTITUTION, ETC.** Under the constitution of March 6, 1945, the president is chosen by direct popular election for four years, and is eligible for re-election. José Velasco Ibarra came to office in 1944. A single chamber of deputies is chosen for two years by elections on a provincial basis, extra deputies being chosen by special groups. All literate adults, men and women, are eligible to vote. The Roman Catholic faith is generally professed, maintaining an archbishop and six bishops, but is not officially established; all religions are tolerated. Primary education is free and compulsory. There are universities at Quito, Guayaquil, and Cuenca. There is a small standing army, with compulsory military service. The unit of currency is the sucre.

**ECONOMIC CONDITIONS, INDUSTRY, ETC.** A large part of the world's supply of cacao comes from Ecuador. The weaving of Panama hats is an important industry;

nearly 3,000,000 are exported annually. The chief exports are cacao, coffee, rice, rubber, bananas, ivory nuts, balsa wood, hats, and a little kapok, mangrove bark, and alligator skins. Cotton is raised in Manabí and tobacco in Esmeraldas. Some gold is produced in the Andes. Deposits of petroleum occur in Guayas, some 300,000 tons, mostly crude, being exported annually; sulphur in Chimborazo and the archipelago.

Guayaquil, the chief port and the largest town in the republic, is linked with Quito by a mountain rly. 288 m. long, which traverses one pass of the Western Cordillera. There are eight other short lines. Main roads total 1,600 m., but over the greater part of the country bridle-paths and mules are the means of transport. Cuenca, Ambato, Riobamba, Loja, and Latacunga are other towns.

**HISTORY.** Before the European discovery of America, the mountain plateau was the seat of a monarchical native civilization, inferior to that of the Incas, but notable for its organization and skill in the arts of building, stone-carving, weaving, pottery, and the working of gold and silver. Towards the end of the 15th century the Inca monarch, Huayna Capac, defeated the king of Quito, and added his dominions to the Inca empire. By the daughter of the conquered chief, the Inca conqueror had a son, Atahualpa, who became the Inca ruler of Quito. He then claimed the throne of the Inca empire, and dethroned his brother, the legitimate heir. He himself lost his kingdom and his life at the hands of Pizarro, the Spanish invader, in 1533. The conquest of Peru by the Spaniard was naturally followed by the occupation of Quito. The kingdom of Quito, which included territory now belonging to Colombia, constituted thenceforth a presidency or government, subordinate to the Spanish viceroy of Peru. But in the 18th century the presidency of Quito was made subordinate to the newly established viceroyalty of Santa Fé de Bogotá.

In 1808 a revolutionary or republican movement broke out in Quito; but, after four years of confused tumult, Spanish authority was re-established, and subsisted until the decisive victory of the republican commander Sucre in the battle of Pichincha in 1822. Quito was now incorporated into the extensive republic or federation of Colombia under the authority of Bolívar. But in 1830 that rather artificial political system was

broken up into the three separate republics of Venezuela, New Granada (now Colombia), and Ecuador.

There followed a stormy period of personal rivalries, despotisms, factions, civil wars, frontier wars with Colombia, and boundary disputes with Peru. From 1859 to 1875 the country was ruled by García Moreno, an ultra-clerical conservative, who attempted to set up a kind of Catholic theocracy, to be guided by the authority of the pope. His dictatorship, more stable than previous governments, was by no means peaceful; and his assassination in 1875 opened a fresh era of disorder and conflict.

Ecuador began to benefit with the rest of South America by economic expansion in the 20th century, though its political temper remained erratic, few presidents completing their terms without the threat or practice of revolution. In foreign affairs the outstanding question was that of frontiers, especially with Peru, but the definitive settlement of 1942, after a period of open hostilities, seemed to promise a less strained atmosphere. Argentina, Brazil, and the U.S.A. assisted in the settlement. Ecuador broke off relations with Germany in the First Great War and was a signatory of the peace treaty. In the Second Great War she severed relations with the Axis powers, Jan. 31, 1942, allowed the U.S.A. to establish bases in the Galápagos Islands and the Santa Elena peninsula, and declared war on Germany and Japan Feb. 9, 1945.

**Bibliography.** Travels in the Wilds of E., A. Simson, 1887; Travels amongst the Great Andes, E. Whymper, 1892; Ecuador, C. R. Enock, 1914; E. the Unknown, V. W. von Hagen, 1939; E.: Portrait of a People, A. B. Franklin, 1943.

**Eczeema** (Gr. *ek*, out; *zein*, to boil). An inflammatory disease of the skin. The term includes cases due to chemical irritants of which the nature is unknown; those in which individuals are over-susceptible to mild irritations, e.g. by sun or wind; and those which become hypersensitive to an irritant so that fresh patches are produced. Predisposing causes are certain toxic states such as gout or rheumatism; deficient elimination as in Bright's Disease; chronic septic absorption as in pyorrhœa; while sensitiveness may be either inherited or acquired. Some disturbance of the nervous system may be present.

Eczeema varies widely in type, stage, and distribution over the

body with the age and condition of the patient, but its essential characteristics are redness of the skin, formation of small blisters or vesicles, watery discharge, formation of crusts and scales, and usually extreme itching. Various types are recognized: erythematous eczema, in which bright red patches appear on the skin; papular eczema, characterized by the formation of small red papules or pimples about the size of a pin's head; vesicular eczema, marked by the appearance of crops of vesicles and watery discharge; and pustular eczema, in which pustules containing matter are formed and on rupturing give rise to yellowish-brown scabs.

Attention must be paid to the general health, sepsis being eliminated, and the liver eased of its burden by the removal of fats, pork, and milk from the diet. Alcohol and tobacco, because of their toxic influence, must be avoided. Many cases of eczema result from specific irritants; the offending substance can sometimes be determined by the reaction produced when it is introduced into the skin, a weal or blister being a positive result. Desensitization can then often be achieved by injecting under the skin minute and gradually increasing doses of the material. This type of eczema has much in common with asthma and urticaria and the conditions are found in certain family groups (see Allergy). Local medical treatment depends entirely on the manifestation of the disease at the time.

**Edam.** Town of the Netherlands, in the prov. of N. Holland. It stands on the Zuider Zee, 12 m. N.N.E. of Amsterdam. The name is derived from a dam built on the little stream Ye. Edam possesses some old brick houses, and a fine church, S. Nicholas, dating from the 14th century and restored, 1602-26. It is noted for its dairy produce, and in particular for round, red-rinded cheese (*v.i.*).

**Edam Cheese.** A Dutch cheese. It is pressed in globular moulds, red outside, a rich apricot inside. It is a cow's milk cheese, weighing about 5 lb. Texture is waxy, and flavour varies in quality. It is not usually considered a gourmet's cheese, but connoisseurs have been known to treat it like Stilton, even to the careful introduction of port wine. Gouda cheese is almost exactly similar, but is made in large flat rounds, and in two grades, one with 45 p.c. fat content, the other with 40 p.c.

**Edda.** Two collections of Icelandic literature, known respectively as the Elder, or poetical, of Saemund, and the Younger, or prose, of Snorri. The former were discovered by Brynjulf Sveinsson, an Icelandic bishop, in 1643. He attributed them to Saemund Sigfusson (1035-1132), but an earlier date is generally assigned by critics. The Prose Edda was compiled by Snorri Sturlason (1178-1241), and is generally ascribed to the 12th century.

**Eddington, Sir ARTHUR STANLEY** (1882-1944). A British astronomer and philosopher. Born



Sir A. S. Eddington, British astronomer

at Kendal, Dec. 28, 1882, he was educated at Manchester university and at Trinity College, Cambridge, where he was senior wrangler in 1904 and fellow in 1907. As chief assistant from 1906 at the Royal Observatory, Greenwich, he established his reputation as a brilliant worker in stellar mathematics. He became Plumian professor of astronomy at Cambridge in 1913, and the next year was appointed director of the university observatory and elected F.R.S. In 1928 he was awarded the Royal Medal of the Royal Society, and in 1930-32 was president of the Physical Society. He was knighted in 1930 and invested with the O.M. in 1938. He died Nov. 22, 1944.

Eddington's principal researches were concerned with stellar motions, in which field he first established that the stars describe orbits under the attraction of the whole galaxy without interfering with one another; with the theory of relativity, which he helped to confirm at the eclipse of the sun in 1919; and with the internal constitution of the stars, in which he first established the importance of radiation within a star and discovered that its brightness depends essentially on its mass. From 1925 he entered the field of philosophy, where his conclusion that much of physics is deducible by pure reason without recourse to experiment has not yet received general assent. He was known to the public through lucid and entertaining popular expositions of scientific topics: Report on the Relativity Theory of Gravitation, 1918; Space, Time and Gravitation, 1920; The Mathematical Theory of Relativity 1923; Stars and Atoms, 1927;

The Nature of the Physical World, 1928; Science and the Unseen World, 1929; New Pathways in Science, 1935; Fundamental Theory, 1947.

**Eddo.** Tuberous stem of several species of colocasia, caladium, etc., of the family Araceae. Though acrid in a raw state, these stems are used as food when cooked. *Colocasia antiquorum*, an E. Indian species, is cultivated for food, even in S. Europe, under the name of taro (*q.v.*).

**Eddy, MARY BAKER** (1821-1910). An American religious leader, the founder of Christian Science. She was born at Bow, New Hampshire, July 16, 1821. Deeply religious by nature, she was from childhood a Bible student. Asa Eddy (d. 1882), whom she married in 1877, was her third husband; she had been widowed, and obtained a divorce. She died at Newton, Mass., Dec. 3, 1910.

It was in 1866, while recovering from the effects of an accident—her recovery she attributed to the reading of Matt. 9, vv. 2-8—that she discovered in the Bible a scientific law underlying the healing works of Christ. She named her discovery Christian Science, and in 1875 issued its textbook, Science and Health with Key to the Scriptures. Other writings by Mrs. Eddy include: Unity of Good; No and Yes; Rudimental Divine Science; Pulpit and Press; Retrospection and Introspection; Christian Healing; The People's Idea of God; Messages to the Mother Church; The First Church of Christ, Scientist, and Miscellany; Christ and Christmas; Christian Science versus Pantheism. Her biographers are E. F. Dakin, 1929; L. Powell, 1930; S. Wilbur, new ed., 1930. See Christian Science.



Mary Baker Eddy, Christian Scientist

**Eddystone.** Lighthouse on the Eddystone Rocks, a dangerous reef, 14 m. S.W. of Plymouth. There have been four lighthouses. The first, a wooden structure, 120 ft. high, by Winstanley, was destroyed by a hurricane in Nov., 1703, three years after its completion. The second, 92 ft. high, was erected by John Rudyerd in 1709, and was burned down in 1755. The third, a granite building by Smeaton, 95 ft. high, was completed in 1759. It was the first in which the stones were dove-





Eddystone Lighthouse, built 1882.  
Left, stump of the old lighthouse

tail jointed, and remained a model for other designs till 1877, when it was found necessary to dismantle it, as the rock foundation had become insecure; the upper sections being transferred to Plymouth Hoe. The present tower, completed in 1882, is located 40 yards from the previous one. Built of granite, with dovetailed stones, it is 168 ft. above low water and is built in circular sections. The lantern shows a group flashing light of two flashes every 30 secs., and has a range of nearly 18 m.

**Ede, JAMES CHUTER** (b. 1882). British politician. He was born at Epsom, Sept. 11, 1882, and



J. Chuter Ede,  
British politician

educated at Dorking high school and Christ's College, Cambridge. He taught in Surrey schools before entering civic life and was chairman of the Surrey county council, 1933-37. He entered parliament in 1923 as Labour member for Mitcham; and represented South Shields, 1929-31, and from 1935. Ede was parliamentary secretary to the ministry of Education in 1940, and Home secretary in C. R. Attlee's cabinet of 1945. He was made a privy councillor in 1944.

**Edelfelt, ALBERT GUSTAF ARISTIDE** (1854-1905). Finnish painter. Born at Helsinki, July 21, 1854, he was trained at Antwerp and at the École des Beaux Arts, Paris, under Gérôme. He painted landscapes, portraits, and compositions with equal skill. Invited by Tsar Alexander III to paint the portraits of his children, he produced, while in Russia, several works in landscape and genre. He died at Borga, Aug. 18, 1905. His finest and most characteristic works are

Divine Service in the Skaergaard, at the Luxembourg; Pasteur in his Laboratory, at the Sorbonne; Laundry; Jesus appearing to Mary Magdalen, and Women in the Churchyard, both at Helsinki.

**Edelinck, GÉRARD** (1640-1707). Flemish engraver. Born at Antwerp, Oct. 20, 1640, he was the pupil of Gaspard Huberti and Cornelis Galle. Visiting Paris in 1665, on the invitation of Colbert, he practised there for the rest of his life, and is more properly classed with the French school. He obtained ample patronage from Louis XIV, was received in the Academy in 1677, and died in Paris, April 2, 1707. He became one of the most brilliant line engravers of the 17th century. In portraiture—e.g. his Dryden and Philippe de Champaigne—Edelinck was equally accomplished.

**Edelweiss** (*Leontopodium alpinum*). Perennial herb of the family Compositae. A native of the mountains of S. Himalaya, it is thickly coated with long woolly hairs, which give it a white appearance, accentuated in the bracts which surround the cluster of terminal yellowish flowerheads. The leaves are lance-shaped, and the plant is about 6 ins. high. It occurs locally in the Alps, but the idea that it is exceedingly rare and can only be gathered in circumstances of great danger is erroneous. Edelweiss is German, meaning "noble white."

**Eden.** English river rising on the borders of Westmorland and Yorkshire, and flowing N.W. past Kirkby Stephen and Appleby into Cumberland, and then past Carlisle to the Solway Firth, which it enters at Rockliff. Its length is 65 m., and it contains salmon. A stream of the same name is a tributary of the Medway, in Kent.

**Eden.** River of Fife, Scotland. It is formed by the confluence of two small burns, the Beattie and the Carmore, at the Kinross-shire border, and flows E.N.E. through the Howe of Fife and past Cupar to the North Sea, which it enters at Guard Bridge by a muddy estuary 6 m. in length; total length 30 m. There is good salmon fishing.

**Eden, GARDEN OF.** In the earliest Biblical account (the Jahwis-

tic) of Creation (Gen. 2, vv. 8-25) Yahweh Elohim plants a garden eastward (from the Palestinian standpoint) in Eden for man to dwell in. In the Septuagint the word for garden, Heb. *gan*, is represented by *paradeisos*, a loan-word (Hebraised *pardēs*) from the Zend *pairi-daeza*, "enclosure"; hence arises the term Paradise as a description of Eden and of the Christian heaven. The garden of Eden seems to have been thought of as a park or pleasure-ground; in Gen. 3, v. 8, Yahweh Elohim is described as walking in the garden in the cool of the evening (cf. Isaiah 51; Ezek. 28 and 31). The name Eden is perhaps from Babylonian *ēdinu*, plain or steppe, more probably from Hebrew *eden*, delight.

The location of Eden is difficult to determine. Sayce identifies the garden with the sacred garden of the Babylonian deity Ea at Eridu, the river which watered it (Gen. 2, v. 10) being the Persian Gulf, and the four branches (vv. 11-14) being the

Pallakopas, the Choaspes, the Tigris, and the Euphrates. E. Naville (Archaeology of the O.T., 1913), comparing Gen. 13, v. 10, "like the garden of the Lord, like the land of Egypt as thou goest unto Zoar," and identifying Zoar with the Egyptian Zar (mod. Kantarah), thinks that the narrator located the garden in Egypt in the western part of the Delta between the Tanitic



Edelweiss. Specimen of the plant on a mountain side

and Pelusiac branches. Another traditional site is at Qurna at the junction of the Euphrates and the Tigris, and an old tree preserved here, claimed as the original Tree of Knowledge, was broken by British soldiers in 1920, and re-erected on a concrete base. It is not, however, of any great age. See Creation Legends; Fall.

**Eden, ROBERT ANTHONY** (b. 1897). British politician. The second son of Sir W. Eden, he was born June 12, 1897, and educated at Eton and Christ Church, Oxford. Entering parliament as Conservative member for Warwick and Leamington in 1923, he was private secretary to Sir A. Chamberlain during the latter's foreign secretaryship, 1926-29. Made under-secretary for Foreign Affairs in 1931, he was lord privy seal three years later,

and during this period still devoted much attention to foreign affairs, especially to the League of Nations. In the Baldwin cabinet



Anthony Eden,  
British politician

of 1935 he was minister without portfolio for League affairs, and his adroit handling of diplomatic situations led to his appointment as Foreign secretary in succession to Sir S. Hoare

on Dec. 23. He resigned in Feb., 1938, as a result of his disagreement with Neville Chamberlain's policy towards Mussolini and Hitler.

On the outbreak of the Second Great War one of the changes by which Chamberlain broadened his Conservative administration was bringing Eden back to office as Dominions secretary. When Churchill became prime minister in May, 1940, he made Eden War secretary, a position he retained until, again on Dec. 23, he succeeded Lord Halifax as Foreign secretary. In 1943 he visited the U.S.A., where he conferred with President Roosevelt and other leaders. He visited Athens several times during the winter of 1944-45, alone and in company with Churchill, for discussions on Greek affairs. He was head of the British delegation to the San Francisco conference, 1945. He retained his post in Churchill's "caretaker" government, May-July, 1945, and held his seat at the election of 1945. A trustee of the National Gallery from 1935, he received the chancellorship of Birmingham university in 1945. In 1939 he published *Foreign Affairs*.

**Edenbridge.** Market town of Kent, England. It stands on the Eden, 25 m. S.S.E. of London by railway. There are some ancient houses and a church in several styles from Norman onwards with a Burne-Jones window. The town is a centre for neighbouring agriculture. Its annual fireworks display on Nov. 5 is well known. Pop. 3,500.

**Edenhall.** Parish and village of Cumberland, England. It stands on the Eden, 3 m. N.E. of Penrith. At Eden Hall, former seat of the Musgraves, was an ancient enamelled drinking goblet, known as the Luck of Eden Hall, which, according to tradition, was taken from the king of a fairy band feasting near S. Cuthbert's Well in

the grounds, who, when departing, exclaimed:

If e'er this cup shall break or fall,  
Farewell the luck of Eden Hall

This goblet was removed to the Bank of England. In Longfellow's translation of Uhland's ballad on the Luck of Eden Hall the glass is represented as having been destroyed.

**Edentata** (Lat. *edentatus*, toothless). Group of mammals without front teeth, and sometimes without cheek teeth also. They comprise the sloths, ant-eaters, and armadillos, all of which are S. American. The pangolins and the aard-vark are included in the order. Where cheek teeth are present in the edentates, they are of simple structure, have no enamel, are without roots, and continue to grow throughout life. All the genera are land animals, and while the sloths and some ant-eaters live in the trees, the armadillos are burrowing animals. They are insectivorous, except the sloths, which are vegetable feeders.

The living representatives of this order are insignificant in number and degenerate in structure compared with those found in a fossil state. Fossil skeletons are found in the Pampa formation of S. America. See Mammals.

**Eden Treaty.** Name sometimes given to the commercial treaty negotiated by Pitt and signed Sept., 1786, by William Eden (later Lord Auckland) for Great Britain and Count Vergennes for France. It removed several restrictions on trading between the two countries, but its effect was nullified by war in 1793 following the French Revolution.

**Eder Dam.** Dam on the river Eder, a tributary of the Weser, Germany. On May 17, 1943, Lancasters of the R.A.F., carrying special mines, attacked the Mohn,

Sorpe, and Eder dams. The Eder was breached in two places on its upstream face by mines dropped from aircraft at less than 100 ft. The dam, a curved, gravity concrete structure, 157 ft. high and 1,312 ft. long, was built in 1914, and the reservoir, the second largest in Germany, contained 200,000,000 tons of water. The dam compensated the Weser for water taken from it for the Mittelland canal, the link between all main navigable rivers W. of Berlin. Without the dam either the canal or the Weser would become unnavigable. After its destruction the water swamped vast areas and flooded factories, power stations, and towns, Kassel, 35 m. away, being inundated.

**Edessa.** An ancient city of Osroënē in the N.W. of Mesopotamia, on the river Scirtos (Daisan). Founded by Seleucus I and called Antiochia Kallirhoe by Antiochus IV, after the downfall of the Seleucid empire it became the capital of an independent kingdom from 137 B.C. to A.D. 216, under rulers called by the title Abgar (*q.v.*). It then became a Roman military colony, under the name of Colonia Marcia Edessanorum. After the division of the Roman Empire into East and West, Edessa became an important centre of Christianity. During the reign of Justin I it was destroyed by an earthquake and rebuilt as Justinopolis in 525. It is the modern Urfa (*q.v.*), in Asiatic Turkey. The town of Edessa in Greece (pop. 13,115) is capital of the Macedonian dept. of Pella.

**Edfü** or **ARBO.** Town in Egypt on the left bank of the Nile, 485 m. S.S.E. of Cairo. It is celebrated for its beautiful and almost perfect temple dedicated to Horus, one of the finest Ptolemaic buildings in Egypt; now that the temple of Philae is submerged this is the best example still to be seen. Edfü is the Greek Apollinopolis Magna.

**Edgar** or **EADGAR** (944-75). King of the English. The younger son of King Edmund, he became king as the result of a rising against his brother Edwy. The brothers were not apparently hostile to each other, but one party wanted Edgar for king and the witan decided that he should rule the land north of the Thames. In 959 Edwy died and Edgar became king of the whole country. His coronation, which did not take place until May, 973, is important in the history of that ceremony, in that, for the first time, the two archbishops took part. After this the king sailed to Chester



Edenhall. Drinking goblet known as the Luck of Eden Hall, with its case

From a drawing by C. G. Harper

and on the Dee was rowed by six or eight vassal kings. He assumed a certain vague overlordship, his authority extending to Ireland, and called himself emperor. He fought against the Welsh, but his reign rightly earned for him the title of the peaceful. He formed a fleet for service against the pirates, and showed zeal in putting down crime. With S. Dunstan he reorganized the monasteries. Edgar died July 8, 975, and was buried at Glastonbury. His son Edward, called the Martyr, succeeded to the throne.

**Edgar Atheling** (d. c. 1130). English prince. The son of Edward the Exile and grandson of Edmund Ironside, he was born in Hungary, but was brought to England in infancy. After Harold's death in 1066 he was proclaimed king by the northern earls, and in 1068 and 1069 was involved in unsuccessful rebellions in the N. of England. Reconciled to William the Conqueror in 1074, he lived at his court in Normandy for twelve years. In 1097 he deposed the Scottish usurper Donald Bane and seated his own nephew Edgar on the throne. He went on crusade in 1099 and in 1106 was taken prisoner at the battle of Tenchebrai while fighting for Robert of Normandy against Henry I. He was released, but the rest of his life was spent in obscurity.

**Edgbaston**. South-western suburb of Birmingham, England. Almost entirely residential, it includes the Oratory of S. Philip Neri (1847), the buildings of Birmingham university at Bournbrook, and the city cricket ground on which Warwickshire C.C. play matches. Neville Chamberlain was Conservative M.P. from 1929 until his death in 1940. *See* Birmingham.

**Edge, SELWYN FRANCIS** (1868-1940). British motoring pioneer and agriculturist. Born in Sydney, N.S.W., March 29, 1868, he was brought to England as a child and privately educated at Norwood. He became one of the best cyclists of his time, and rode from London to York in 12 hours 50 mins. An early motor manufacturer, in 1896 he founded the De Dion Bouton business in England. In 1899 he established the Motor Power Company and was later connected with the Napier Company. He won the Gordon Bennett International Paris-Vienna race in 1902, the Harmsworth motor boat trophy, and for 17 years held the record of 1,581 miles for continuous 24-hour driving. Retiring in 1912, he took up farming. In 1917 he was con-

troller of the agricultural machinery department of the ministry of Munitions. Edge established the largest pedigree pig-breeding business in Great Britain and introduced the farm tractor. In 1921 he returned to the motor industry as director of A.C. Cars Ltd. He died Feb. 12, 1940.

**Edgehill, BATTLE OF**. First battle of the Civil War, fought between Charles I and the parliamentarians, Oct. 23, 1642. The hill is a ridge in Warwickshire, on the borders of Oxfordshire. The king was marching from Shrewsbury to London, and the parliamentarians, under Essex, moved across to intercept him. On the morning of the 23rd Essex marched out of Kington to find the royalists drawn up on Edgehill, about 3 m. away. His artillery had not yet arrived, so he left the initiative to his enemies, who opened the fight.

Each army was drawn up with the infantry in the centre and cavalry on the wings. On both wings the royalist horse, one body under Prince Rupert, the other under Wilmot, drove the parliamentarians before them and followed them for miles. In the centre, however, the parliamentarians stood firm and their horsemen charged the royalist centre. Only the return of Rupert's following and the oncoming night saved Charles from utter defeat. Charles had about 14,000 men; Essex about 10,000.

**Edgeworth, MARIA** (1767-1849). British novelist. Born at Black Bourton, Oxon, Jan. 1, 1767, she was one of many children of Richard Lovell Edgeworth, whom she accompanied to Ireland in 1773. She spent most of



*Maria Edgeworth*

her life on her father's estate at Edgeworthstown, obtaining her knowledge of the Irish peasantry from dealing with his tenants and her familiarity with fashionable life from association with his neighbours. She wrote *Practical Education*, 2 vols. (1798), in collaboration with her father, and it was largely on his account that she rejected a proposal of marriage made to her by Count Edlerant, a Swede, at Paris, in 1802.

Visits to London and the Continent between 1803 and 1844 brought her into touch with the

best literary and fashionable society of her time, and in 1823 she visited Scott at Abbotsford, a visit returned by him at Edgeworthstown two years later. Scott's admiration of her literary ability is recorded in *Waverley*, where he declared that her presentation of Irish life and character had induced him to attempt a like service to his people in *The Waverley Novels*. In addition to the three novels of Irish life on which her fame is based—*Castle Rackrent*, 1800; *The Absentee*, 1812; *Ormond*, 1817—she wrote *The Parent's Assistant*, 1796, enlarged ed. 1800; *Moral Tales for Young People*, 1801; and completed her father's *Memoirs*, 1820. The amiable and practical qualities displayed in her life distinguish Maria Edgeworth's books, which despite their didacticism still make a strong human appeal. She died May 22, 1849.

*Bibliography*. Life, H. Zimmern, 1883; *Life and Letters*, ed. A. J. C. Hare, 1894; *The Edgeworths: a Study of Later 18th Century Education*, A. Paterson, 1896; *Life*, E. Lawless, 1904; *Chosen Letters*, ed. F. V. Barry, 1931.

**Edgeworth, RICHARD LOVELL** (1744-1817). British author. Born at Bath, May 31, 1744, he belonged to the English family that made their home at Edgeworthstown, co. Longford. Educated at Drogheda and Longford, he went to Trinity College, Dublin, and then to Oxford. Of independent means, Edgeworth was able to devote his time to study, friendship, travel, and experiment. He invented a system of telegraphy, was an early believer in the possibility of electricity, and helped to found the Royal Irish Academy. From 1772 until his death, June 13, 1817, most of his time was spent in Ireland, looking after his estates. For a short time he sat in the Irish parliament. His works include *Practical Education*, 1798, and *Memoirs*, parts of both being written by his daughter Maria (*v.s.*).

**Edging Plants**. Plants suitable for planting to make an edge to beds and borders. For sunny places the best of the perennial kinds are thrift (*armeria*), aubrietia, mauve catmint (*nepeta*), pink and silvery saxifrage. The old white, sweetly-scented pink named Mrs. Sinkins, and the Cheddar pink (*Dianthus caesioides*), are favourites for this purpose, but the newer Allwoodii pinks of various colours are often chosen. These plants need well drained soil; sand should be added to clay ground, and pinks and saxifrages

need a scattering of lime. All except thrift and saxifrage should be cut back when the flowers have faded. As edgings to shady borders, London Pride (*Saxifraga umbrosa*) and the bellflower named *Campanula muralis* are first-rate. Box is suitable as an edging to formal beds intersected by gravel paths; so, too, is lavender-cotton (*Santolina*) which forms small, grey-leaved bushes that should be pruned hard in spring.

Of annuals the most suitable are the dwarf white and lilac-coloured alyssum, candytuft, Virginian stock, leptosiphon, and dwarf nasturtium.

**Edgren, ANN CHARLOTTE LEFFLER**, DUCHESS OF CAJANELLO (1849-92). Swedish novelist and dramatist. The daughter of Prof. Leffler, a mathematician, she was born near Stockholm, Oct. 1, 1849, and married G. Edgren in 1872. Her earlier tales were issued under the pen-name of Carlot, but in 1882 she began a series of novels and plays under her own name, and many of these enjoyed considerable success. One of the plays, *Sanna Kvinnor*, 1883, was translated into English by H. L. Braekstad as *True Women*, 1890. In 1890 she married the Italian mathematician, the duke of Cajanello. She died at Naples, Oct. 21, 1892.

**Edgware**. Residential town of Middlesex, England. It is 8½ m. N.W. of Marble Arch, on the road to St. Albans, and is served by London Transport road and rail. Formerly called Eggesware and Edgworth, and once the first village of note on Watling Street after its emergence from London, its manor has been since 1443 the property of All Souls College, Oxford. The W. side is in the parish of Little Stanmore. The parish church of St. Margaret, rebuilt 1765 and 1845, is said to have been part of a monastery; near it was a house of refreshment for the monks of St. Albans as they travelled to and from London. Of the old inns, The Chandos Arms has a fireplace from the mansion of Canons (q.v.).

At Edgware was the forge of William Powell, whose work on the anvil is said to have suggested to Handel the melody of *The Harmonious Blacksmith*. Piper's Green preserves the tradition that a former lord of the manor provided a minstrel for the amusement of the tenants in his service. Brockley Hill, 1 m. farther N., is supposed to be the site of the Roman station *Suloniaca*.

**Edible Birds' Nests.** Nests of certain species of swift (*Collocalia*), found in Australia and the East Indies. They are composed chiefly of the saliva of the birds and are attached to the walls of caverns. The Chinese value them as a delicacy and convert them into a kind of glutinous, but almost tasteless, soup.

**Edict** (Lat. *edictum*). Promulgation, on his entry upon office, by a Roman magistrate, especially a

praetor, of the principles upon which he intended to administer the law during his term. The result of this practice was that side by side with the civil law there grew up a great body of magisterial law which ultimately became the most valuable part of Roman jurisprudence. The word was also used later, especially in France, for certain laws, e.g. the edict of Nantes. See *Praetor*; *Roman Law*.

## EDINBURGH: THE CITY AND ITS HISTORY

Sir William Young Darling and Sir Herbert Maxwell, Bart.

*One of Edinburgh's leading citizens, a former Lord Provost who later became M.P. for South Edinburgh, describes the Scottish capital as it is today; its romantic history is told by a distinguished Scottish historian and former chairman of the National Library of Scotland. See also Arthur's Seat; Canongate; Fettes College; Holyrood; Princes Street, etc.*

Edinburgh is the capital of Scotland and is the headquarters of the administration of Scottish affairs. At S. Andrew's House in the city (built in 1939 by Thomas S. Tait) there is housed the secretary of state for Scotland, who is responsible for education, agriculture, health (which includes housing), and what is called the Scottish home department. The other departments of the United Kingdom are administered in Scotland directly by the minister at Whitehall, but always in association with the secretary of state for Scotland, although in the house of commons responsibility is accepted by the specific minister, except for the foregoing four departments under the secretary of state.

The law courts—the court of session and the high court of justiciary—are located in Lawnmarket and Parliament Square, while at Register House, opposite the G.P.O., are to be found the various record and register offices, including the office of the Lord Lyon court. Thus, Edinburgh is not only an historic capital but an administrative capital.

The population of the city in 1931 (the most recent census) was 439,010, but there were many fluctuations during the Second Great War. Edinburgh is one of the largest cities in the United Kingdom in extent; it measures 11½ m. by 8 m. and is one of the earliest of the planned cities of the world. It returns seven members to parliament.

The Royal Mile, in The Old Town, as it is called, is what re-

mains of the city's earlier days and in its historic houses, ranging between the castle (now the national war memorial) and the palace of Holyroodhouse, the nobility and gentry of the days gone by lived. At the beginning of the 19th century the town's boundaries extended, and what is still called The New Town came into being under the inspiration of the Adam brothers. Here, in Princes Street, George Street, Queen Street, Heriot Row, Northumberland Street, and a succession of parallel streets and squares, is to be found one of the best examples of planning in the kingdom, and these broad highways are a lasting memorial to a generation which had a wide conception of the best in city life.

The city of Edinburgh is grouped round the centre of Scottish government; but it has an industrial life independent and entirely its own. Its chamber of commerce was instituted by royal charter in 1786. For generations it has been a brewing centre. Unique wells rising from its unusual geological strata form the basis of this important and widespread industry. Its other activities include the making of textiles, particularly in the field of knitted wear, engineering in all its aspects—and, very notably, light engineering and electrical engineering—shipbuilding and ship repairing in what was the port of Leith and became in 1918 part of the city of Edinburgh, and the manufacture of rubber an industry which includes the largest employer of female labour in Scotland.

Edinburgh University (v.i.) is the pioneer educational institution of the city. Closely associated with it are the medical schools and hospitals and, in another field, such



Edinburgh city arms

colleges as the Heriot Watt college (specialising in technical education), and the Edinburgh college of art, which has a notable record in the field of architecture and town planning.

The schools of Edinburgh, too, are of marked importance. Under many public trusts, notably the company of merchants of the city of Edinburgh, several famous schools are maintained by the generous endowments of days gone by. The best known of these, perhaps, is George Watson's college, at which have been educated chancellors of the exchequer and other ministers of the crown; Daniel Stewart's college; Edinburgh Academy (*v.i.*), at which Lord Cunningham was educated; Fettes college, founded by an Edinburgh grocer and former lord provost of the city, a residential school which attracts pupils from all over the country and includes Lord Simon among its notable scholars; the Royal high school, associated with Sir Walter Scott; Heriot's hospital, whose founder was banker to James VI of Scotland (afterwards James I of England); the Mary Erskine schools for girls; and George Watson's ladies' college. These famous educational establishments charge for education. Excellent schools are also provided under the education committee of the local authority within the boundaries of the city of Edinburgh.

#### Centre of Book Production

Edinburgh is among the great printing centres of the world and the making of books in all its aspects is a major preoccupation of a city which rests upon a wide and diverse cultural basis. Ancillary to the book producing industry, and of considerable importance, are the manufacture of printing machinery and printing inks, bookbinding and book illustration.

The government of the city of Edinburgh is under its town council, which consists of seventy-one members with a lord provost, who is entitled to the designation right honourable, bailies, a city treasurer, a lord dean of guild, and councillors. Its administration covers all civic activities and it has its administration grouped round the several departments. The town clerk and the city chamberlain are, respectively, the principal officers in the legal and financial spheres, supported by the burgh engineer, the medical officer of health, the city architect, the chief education officer and others. After the Second Great War an important new activity was under-

taken in the organization of the annual Edinburgh Festival (*q.v.*), which attracted visitors from all over the world.

The city is known for economical management and for many years the rating burden has been maintained at under 10/- (8s. 2d. in the £ in 1946). The economy and efficiency of its administration has made Edinburgh a place which people, from home and abroad, tend to select as the place of their retirement, more especially if they have a family to educate.

The plan of the city of Edinburgh is unique and it owes, possibly, as much to nature as it does to art. It lies in a semi-circle of hills—from Corstorphine Hill (home of Edinburgh's far famed zoological park), the Pentland Hills, Arthur's Seat and the Salisbury Crags to the Calton Hill (with its observatory) and the fringes of the Forth. A beautiful and romantic city, it has evoked praise from writers of every nation and facing the spacious Princes Street are the celebrated Princes Street gardens, with a distinctive floral clock and many monuments.

#### Principal Public Buildings

The taste of its citizens is reflected in many buildings, public and private, of importance. The Usher Hall, presented by a generous Edinburgh citizen, the McEwan Hall, which owes its existence to a like generosity, the City Chambers, the National Gallery, the Antiquarian and the Royal Scottish Museums, the Bank of Scotland on the Mound and other head offices of great banks, St. George's parish church, the cathedral of St. Giles, and the much more recent episcopal cathedral of St. Mary in the west end of the city: these are only a few of the buildings well worth seeing for their individual quality. Combined, they make Edinburgh a city of character and distinction where the old blends with the new, and the whole produces a feeling of unity and satisfaction.

The city is diversified by many parks and gardens. The Links at Bruntsfield, Leith Links down by the water side, the golf courses on the Braid Hills, at Craigentiny, and at Carrick Knowe, the private golf courses at Barnton, Swanston, Duddingston, and Liberton diversify the streets and thoroughfares; the gardens in the squares lead on to the lovelier and more extensive Royal Botanical gardens at Inverleith; there are many bowling greens, tennis courts, playing fields and sports grounds of one

sort and another. Edinburgh has always had a strong appreciation of the importance of swimming and the many public baths include an open air pond at Portobello, completed in 1936.

Sir Walter Scott called Edinburgh "mine own romantic town"; Robert Louis Stevenson, dying in Samoa, sighed for "that long line of glittering gas lamps in Princes Street"; Robert Burns hailed the capital city as "Edina, Scotia's darling seat"; and there have been lesser writers no less devoted to the city. Edinburgh is a communicative city and its citizens have an outward look. Successive lord provosts have been notable for their wide contacts, all over the world, particularly to the many centres where Scotsmen live and remember their capital city.

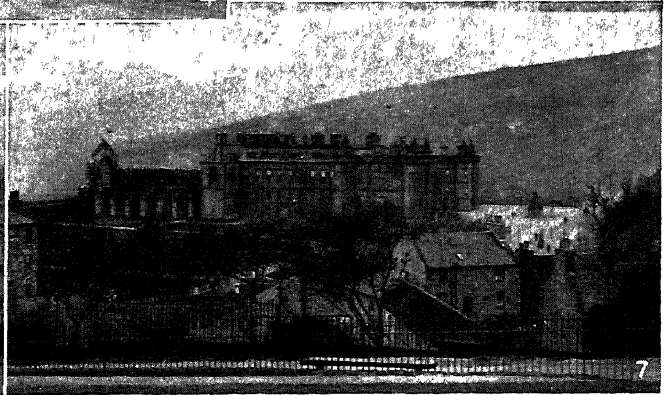
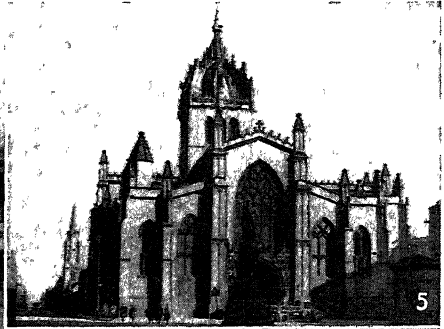
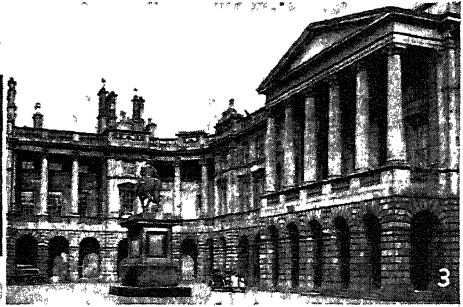
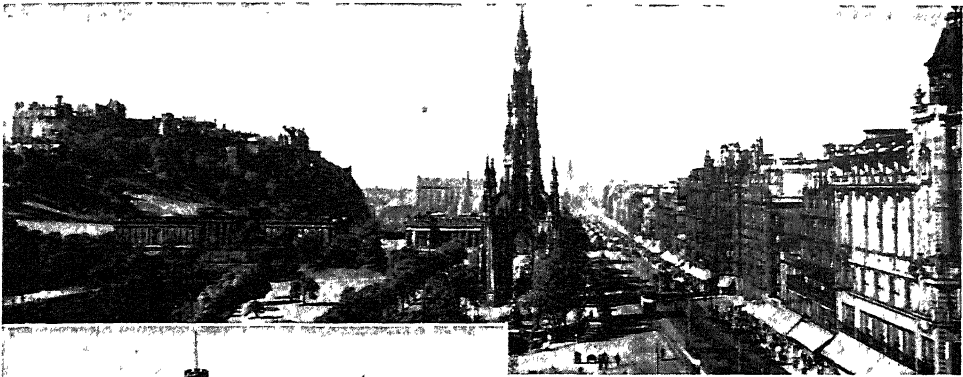
#### Transport and Communications

The city of Edinburgh has a special bureau for communications with the outer world, and the headquarters of the Scottish Tourist Board is located there. Edinburgh's roads date back to the very dawn of communications in Britain. Through it passes the Great North Road, as have passed through it the invading armies of the past and the fighting Scotsmen of yesterday. Edinburgh has two principal railway stations, the Waverley and the Caledonian. City transport is by publicly owned electric tram and motor omnibus services, supplemented by the coach service which covers Scotland by road with Edinburgh as its centre. Turnhouse aerodrome is an important air station.

#### William Young Darling

**HISTORY.** In primitive times, when what is now Scotland was peopled by tribes chronically at war with each other, but combining on occasions against some powerful invader, isolated crags or mounts were highly esteemed for defensive purposes. Among numerous sites of that character in northern Britain, none stands out more conspicuous than the Castle Rock of Edinburgh, which would no doubt be seized by the early colonists of Lothian and fortified by the usual rampart of stone and palisade. Within the enclosure they planted their wattled huts, and subsisted by the chase; for according to Strabo (25 B.C.), and Dion Cassius (c. A.D. 150-235), the natives of northern Britain were ignorant or independent of agriculture when the Roman legions arrived there.

Of Edinburgh as a town, nothing



1. Princes Street; in the centre are seen the tall pinnacles of the Scott monument, behind it, to the left, the colonnade of the National Gallery, and behind this again, Castle Hill. 2. The Castle. 3. Parliament House.

4. University buildings: the university was incorporated by a charter of James VI. 5. West front of St. Giles's Cathedral. 6. House of John Knox, in Canongate. 7. Holyrood Palace: in the background, Arthur's Seat.

**EDINBURGH OLD AND NEW: PLACES OF NOTE IN SCOTLAND'S CAPITAL**





Edinburgh. Map of the environs of the Scottish capital, including part of the Pentland Hills

appears, even in tradition, until after the conquest of Lothian by Eadwine, Saxon king of Deira (Yorkshire) and Northumbria, in the 7th century. It appears from King David's foundation charter of Holyrood in 1128, and Simeon of Durham's chronicle written in the same century, that King Eadwine was thus early regarded as the eponymus, for in both of these writings the place is called Edwines-burgh. The Gaelic branch of the Celts called it Dunedin; among the Welsh population of Strathclyde it was known as Dineiddyn or Mynydd-agneid, the latter name appearing to signify the mount of the Painted People or Picts. According to the Pictish Chronicle the Saxons held Oppidum Eden till they surrendered it to Indulf, son of Constantine king of Scots (954-962); but all is misty and vague until Malcolm III was persuaded by Queen Margaret to remove his seat of government from Dunfermline to Edinburgh, about 1060.

In 1128 David I founded the abbey of Holyrood, and empowered the convent to form the burgh of Canongate, which retained its separate jurisdiction until 1856, when it was united to the corporation of Edinburgh. The date of the erection of Edinburgh into a royal burgh is unknown. Doubtless it had already received a charter before David I (1124-53) made it his principal residence, but many years had to run before it was recognized as the capital of Scotland. The strategic importance of Edinburgh having been

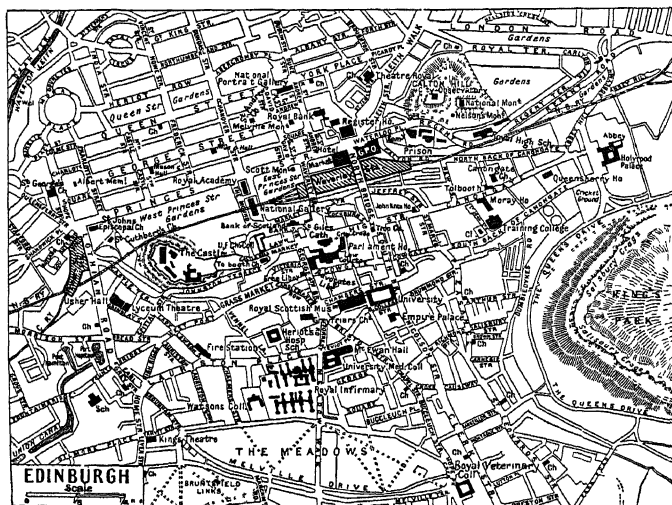
enhanced by the loss of Berwick in 1296 and Roxburgh in 1368, it became recognized as the most important town in Scotland, and increased steadily in population and commerce.

City and castle were taken by Edward III of England in 1355, but were recovered to the Scots by a clever stratagem in 1341. To the parliament summoned in 1357 for the special purpose of raising 100,000 marks for the ransom of David II, Edinburgh returned three burgesses, and appeared for the first time in precedence over all other burghs. It was sacked

and burnt by Richard II in 1385 and besieged by Henry IV in 1400, but the castle held out until Henry had to raise the siege in order to deal with Glendower's rebellion.

From this period onward Edinburgh, in common with the whole of Scotland, suffered from the arbitrary power of the great barons, who made full use for selfish ends of the opportunities afforded by the imprisonment in England of David II and James I, and by the frequency with which the succession to the throne devolved on an infant, the average age of seven successive sovereigns from 1406 to 1567 on their accession being but six years. Thus the 4th earl of Douglas, keeper of Edinburgh Castle, and a number of other nobles and officials, not only refused to pay the duties leviable upon wool and hides which they exported, but did not scruple to appropriate money which the customs officer had collected. In consequence, the gross customs of the city, which amounted to £2,047 in 1416, had fallen to £1,098 5s. 4d. in 1418, though the volume of trade was considerably greater. Bitter complaints of oppression were continually made to the government; Livingstone, guardian of the boy king James II, and Chancellor Crichton made these serve as excuse for ridding themselves of a dangerous rival, the 6th earl of Douglas, a lad of 17, whom, with his brother David, they lured to a banquet in Edinburgh Castle and had them both butchered in the king's presence.

In 1448 the town council, taking advantage of the respite of English invasion during the Wars of the



Edinburgh. Plan of the central part of the city. The valley spanned by the North Bridge separates the Old Town on the S. from the New Town on the N.

Roses, set to work to strengthen the defences of their city. The king's garden on the N. side, now occupied by the Waverley rly. station and lines, was inundated by a dam thrown across the E. end, thereby forming the North Loch, whence a wall was built round the E. and S. sides of the city to the Castle Rock near the West Bow.

During the reign of James IV (1488-1513) the revival of learning first made itself felt in Edinburgh. The guild of chirurgion barbers received a royal charter in 1505, to develop under a fresh charter in 1684 into the Royal College of Surgeons of Edinburgh. In 1507 the first printing press in Scotland was established in Edinburgh. But a new era of bloodshed was inaugurated on Flodden Field in 1513, where James IV was killed with the flower of Scottish nobility and gentry. In 1544 the earl of Hertford sacked and burnt Edinburgh, wrecked Holyrood Abbey, drove away the monks, and gutted the palace, but was repulsed in attacking the castle. He returned in 1547 under his new name of Protector Somerset, and completed the destruction of Holyrood.

#### The Scottish Reformation

In the 16th century Edinburgh became the vortex of the Scottish Reformation. Parliament enacted the establishment of the Protestant religion in 1560, proscribing the Mass under penalty of death. Queen Mary, returning as a young widow to the capital which she had left as a child of six years, found the churches stripped of all adornment, the altars wrecked, the clergy, secular and regular, of her own faith banished, while from the pulpits Knox, Bruce, and other zealots hurled vehement denunciation against the Scarlet Woman. Knox laid the foundation of that system of national education to which Edinburgh owes so much of her distinction as a seat of learning and letters; but, dying in 1572, he did not live to see the foundation of the university in 1583.

Queen Mary's personal reign covered no more than six stormy years, perhaps the darkest and bloodiest in the whole history of Edinburgh. Conspicuous among the crimes perpetrated were the slaughter in Mary's presence of her favourite, David Rizzio, in 1566, and the murder of Darnley in 1567.

The city, which is believed to have contained at the time some 30,000 inhabitants, suffered considerably in trade when James VI succeeded to the throne of England and removed his court to London. He promised to revisit Edinburgh every third year, but fourteen

years went by before he returned for the first and last time. Charles I was crowned in Holyrood in 1633, eight years after his accession—the only coronation ever performed in the Scottish capital, except that of James II in 1437. In 1637 the city was thrown into ferment when Charles sent Laud's liturgy to Edinburgh, with a command that it was to be used in all the churches. Edinburgh had been staunchly loyal hitherto; but this gave immediate birth to the National Covenant which was signed in Greyfriars Churchyard, Feb. 28, 1638. The obnoxious liturgy was withdrawn, Sept. 17, but things had gone too far; the Covenanters were under arms, and in 1639 Sir Alexander Leslie, one of Gustavus Adolphus's veterans, stormed and captured Edinburgh Castle. After the pacification of Berwick, it was handed back in 1640 to Sir Patrick Ruthven, who also had served long under Gustavus Adolphus, for the king; but when war broke out afresh in June, it was captured once more by the Covenanters under Leslie.

In 1642, when King Charles took the field against his parliament, the people of Edinburgh were fervid Covenanters; but the Scottish privy council declared for the king by eleven votes to nine. On Aug. 2, 1643, the general assembly promulgated the Solemn League and Covenant, which sought to impose Presbyterianism by compulsion on both England and Scotland. Charles I having been executed Jan. 30, 1649, the Scottish Estates caused his son to be proclaimed king at the Mercat Cross of Edinburgh on Feb. 5, but the Covenanters would have none of him.

#### Covenanters and Anti-Jacobites

The duke of Hamilton, the earl of Huntly, and the marquess of Montrose were executed in succession in Edinburgh. Cromwell invaded Scotland, July 22, 1650, utterly defeated Leslie's Covenanters at Dunbar on Sept. 3, took possession of Edinburgh and proclaimed the Commonwealth. Ten years later, at the Restoration, "the Maiden," an instrument similar to the guillotine, was set to work at the Mercat Cross.

In 1688 the Edinburgh populace was vehemently anti-Jacobite. King James VII and II had escaped to France, but the mob overpowered the guard in Holyrood Palace; wrecked the abbey church, which had been redecored as the Chapel Royal, and, bursting open the royal burial place, scattered the bones of Scottish kings and queens. The duke of Gordon still held the castle for the king, and

his historic parting with Dundee, when that intrepid soldier rode from the Nether Bow to his death at Killiecrankie, forms the subject of Scott's lyric *Bonnie Dundee*.

The city was riotously convulsed during the proceedings in the Scottish parliament over the legislative union with England in 1707. It was little affected by the Jacobite rising of 1715, but in 1745 Prince Charles Edward, after defeating Sir John Cope at Prestonpans, took possession of Edinburgh, proclaimed his father king James VIII at the Mercat Cross, and held a brilliant court at Holyrood for more than two months.

#### Intellectual Edinburgh

Notwithstanding the loss of custom and prestige caused by the departure of James I and his court in 1603, the misery and bloodshed entailed by the civil wars and religious persecution of the 17th century, and the further loss consequent on the union of parliaments in 1707, Edinburgh continued to advance both materially and intellectually. Allan Ramsay the Elder, 1686-1758, who began life as a wig-maker, must be honoured as chief pioneer in the revival of literature, for he founded the literary coterie called the Select Society, reconstructed in 1755 as the Society for Encouraging Art, Science, and Industry. The torch which he kindled was passed from hand to hand by such writers as James Hamilton of Bangour, Thomson of The Seasons, David Hume the historian, John Home the tragedian, Dalrymple Lord Hailes, Home Lord Kames, Burnett Lord Monboddo, "Jupiter" Carlyle, Adam Smith, political economist, and Henry Mackenzie, the "Man of Feeling," who introduced Burns to Edinburgh society in 1787. These created a literary atmosphere which lingers in the Scottish capital to this day, having received fresh vigour from Jeffrey, Brougham, Lockhart, "Christopher North," and, most illustrious of all, Walter Scott.

Of social gaiety in Edinburgh there was no lack in the 18th century. Scotland had entered at the Union of 1707 on a period of prosperous industry which had been impossible during the war with England and the civil wars of the 17th century. The revival of agriculture set country gentlemen at work reclaiming waste lands; their increasing revenues enabled them to bring their families to town for the season to lodge in "lands" (flats, as they would be called now), erected high over the malodorous, crowded "wynds" and courts opening out of the High

Street. The Old Town had become congested in a degree incompatible with decency and sanitation. The narrow limits of the ridge whereon the city was built made lateral expansion impossible, unless the North Loch were drained away and a New Town laid out on the far side thereof. Plans were prepared by the architect James Craig, and the foundations of the first house in the New Town were laid on Oct. 26, 1767. The result has been the creation of one of the most striking urban landscapes that can be found in any country. The picturesque features of the Old Town have, indeed, been greatly impaired by the removal of at least two-thirds of the ancient "lands," as the lofty houses piled high on the ridge were called, but enough remains to offer striking contrast to the spacious streets and commodious architecture of the New Town. The scene would have been even more impressive had the North Loch been purified and retained as an ornamental sheet of water, instead of being drained away and its bed occupied by the North British Railway (later part of the L.N.E.R.). But enough is left to justify the pride with which her citizens speak and think of Edinburgh as the Modern Athens, the Castle Rock being no mean counterpart to the Acropolis, while the Calton Hill reflects the contours and relative position of Lycabettus.

Herbert Maxwell

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**Edinburgh, ALFRED ERNEST ALBERT, DUKE OF (1844-1900).** British prince. The second son of Queen Victoria, he was born at Windsor, Aug. 6, 1844. He was educated for the Navy, and in 1893 was made admiral of the fleet. In 1862 he was elected king of Greece, but for political reasons refused the crown. He was created duke of Edinburgh in 1865, and in 1893 became reigning duke of Saxe-Coburg and Gotha, surrendering his privileges as an English peer, but retaining

his rank of admiral. He was a collector and a patron of music. In 1874 he married Marie Alexandrovna, only daughter of Alexander II of Russia; she died Oct. 25, 1920. The duke died July 30, 1900, and was succeeded as duke of Saxe-Coburg by his nephew, Leopold Charles, duke of Albany.

**Edinburgh, DUKE OF (b. 1921).** British prince. See Philip, p. 6470.

**Edinburgh Academy.** Scottish public school. Incorporated by royal charter, it was opened by Sir Walter Scott, 1824. The headmaster is termed the rector. The academy is divided into an upper school and a preparatory school, the junior department of which is in Denham Green House, about a mile away. Primarily a day school, it has four houses for boarders situated beside New Field, the larger of the two playing fields; the other field, Raeburn Place, was the scene of the first rugby football international in 1871. The Edinburgh Academical F.C., composed of old boys and founded 1858, is the oldest football club in Scotland.

**Edinburgh Festival.** Annual international festival of music and drama, at Edinburgh, Scotland. First held in 1947, it lasts for three weeks in Aug.-Sept. and attracts visitors from all parts of the world. Continental and British orchestras are engaged, and new and classic plays performed by British and foreign companies; film showings, ballet performances, and an art exhibition are other features.

**Edinburgh Review.** First of the great critical quarterlies, but the second of the same name. Its predecessor was brought out in 1755, under Adam Smith, Alexander Wedderburn, and others, and ran to only two numbers. The famous blue-and-buff Whig organ was founded by Sydney Smith, Oct., 1802. Francis Jeffrey was editor 1803-29, Macvey Napier 1829-47, William Empson 1847-52, Sir George Cornewall Lewis 1852-55, Henry Reeve 1855-95, Arthur Elliott 1895-1912, Harold Cox 1913-29, when publication ceased. Jeffrey's literary criticism provoked Byron's English Bards and Scotch Reviewers; and Macaulay's Essays first appeared in the Edinburgh.

**Edinburgh University.** Founded in 1583, this obtained in 1621 the same privileges as the other three Scottish universities, which were confirmed at the time of the Union (1707). Alterations in its constitution were made in 1858 and 1889. Edinburgh has six faculties, arts, science, divinity,

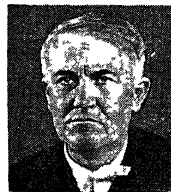
law, medicine, and music, and its professorships usually attract distinguished scholars. Women are admitted to courses and degrees equally with men. Its medical school is specially efficient; Edinburgh also pays much attention to agricultural education, and has courses for the training of teachers and army officers. In 1944-45 it had 3,642 students.

The university is ruled by a university court, a university council, and the senate, while the city council has some share in its government. Its head is the chancellor, but the actual direction is in the hands of the principal. The lord rector, another honorary official, is elected by the students every three years. It unites with the other Scottish universities, St. Andrews, Glasgow, and Aberdeen, to send three members to parliament.

The present buildings, begun in 1789, occupy the site of Kirk o' Field. Prominent among them are the hall and the library, which contain a most valuable collection of books and MSS. In Teviot Row are the extensive buildings of the medical school. The university has numerous and well-equipped laboratories and museums, and offers many scholarships to intending students. In 1919 a site of 115 acres for science laboratories was acquired on the southern outskirts of the city, between Mayfield and Blackford Hill; here were erected buildings for chemistry, geology, zoology, animal genetics, and engineering.

**Edirne.** Turkish name of the city described in this work as Adrianople.

**Edison, THOMAS ALVA (1847-1931).** American inventor. Edison was born at Milan, Ohio, Feb. 11, 1847, of mixed Dutch and Scottish descent, and had almost no regular education. When twelve years old he became a news-



boy on a railway, and at 15 was printing his own newspaper, The Grand Trunk Herald, on a train in motion. He began his technical career as a telegraph operator on the Grand Trunk rly., and made his first invention, a vote-recording machine, when twenty-one. This was followed by the first really practical tape machine and a remarkable series of improvements on

the then crude methods of electrical transmission.

Edison next interested himself in telephony, enormously improving the system based on Bell's invention, and invented the phonograph, first machine for recording and reproducing sound. By discovering the carbon filament in 1879, he advanced electric lighting. In 1887 he invented the kinetoscope, the direct forerunner of the cinematograph, and other subjects on which he worked included magnetic ore separation, storage batteries, motor vehicles, railway signalling, and typewriters. Turning to chemistry, during the First Great War he designed benzol and carbonic acid producing plants. He was granted some 1,300 patents, and he was honoured by many scientific bodies. The range of Edison's inventions was such that he has left his mark on nearly every branch of science, though much of his work took the form of improving appliances invented by others. He died Oct. 18, 1931. Among many Lives are those by F. A. Jones, 1925; F. T. Miller, 1932; W. A. Simonds, 1935; consult also Edison as I Knew Him, Henry Ford, 1930.

**Edith Cavell.** Mt. of Canada. A peak of the Rocky Mts., it is situated in Alberta, close to the border of British Columbia, 14 m. S. of Jasper. It is 11,033 ft. high, and was named after Nurse Edith Cavell. See Cavell, Edith.

**Editor** (Lat. *edere*, to produce). One who controls the production and contents of a newspaper, book, or magazine. On daily newspapers his personality and political and business acumen and knowledge of men and affairs are more vital than literary facility, the necessity of his close attention to detail being obviated by subdivision of labour. In book and magazine production he needs special qualifications according to the nature of the work on which he is engaged. In all cases practical knowledge of the various processes connected with printing, illustration, etc., is essential. See Journalism; Newspaper.

**Edmonton.** A municipal borough of Middlesex, England, adjoining Tottenham, Enfield, and Southgate, and bounded on the E. by the river Lea, which also divides Middlesex and Essex. The New river passes through part of the W. of the bor. Edmonton, which is served by railway and London Transport, has a number of light industries, and there is

timber trade on the Lea. It is associated with Cowper (cf. John Gulpin) and Keats; and Charles and Mary Lamb lie buried in the parish churchyard. It suffered considerable damage from air raids during the Second Great War. One member is returned to parliament. Pop. approx. 100,000.

**Edmonton.** Capital and largest city of Alberta, Canada. It is on the N. bank of the North Saskatchewan river, 793 m. W. of Winnipeg and 771 m. E. of Vancouver, and is served by the C.P.R. and C.N.R. The provincial parliament buildings stand N. of the river, while to the S. is the university of Alberta, founded in 1906. The city owns electric light and power, water, telephone, and street rly

in the 9th century to Bury (now known as Bury St. Edmunds), where the famous shrine was erected. He was held in great veneration as a saint, many English churches are dedicated to him, and his festival is kept on Nov. 20. Consult The History of King Eadmund the Martyr, ed. Lord F. Hervey, 1929.

**Edmund** (c. 922-46). King of the English. The son of Edward the Elder and grandson of Alfred



Edmonton, Canada. Air view of the town showing (centre), the high river bridge; upper picture, the Parliament buildings of the province of Alberta, also to be seen, right centre, in the lower picture

systems. Edmonton is the gateway to the northern minefields, the centre of a rich agricultural country, and the home of many industries. An oil pipe line to Superior, Wis., was begun in 1949. There is a school for training teachers. Pop. 93,817. See Alberta.

**Edmund** OR EADMUND (841-70). English saint, king of East Anglia. Late legends describe him as the son of Alkmund, king of the Saxons, and state that he was born at Nuremberg and adopted by Offa, whom he succeeded as king of East Anglia in 855. Captured by the Danes on their invasion in 870 and refusing to give up Christianity, he was beheaded at Hoxne, Suffolk. His body was removed

the Great, he succeeded his half-brother Athelstan in 940. He fought against the Danes in the north, the result being a division of the kingdom. This did not last long, as Edmund crushed the Danes in Mercia, and was again ruler of the whole land. He subdued Cumbria in 945 and bestowed it on Malcolm, king of Scotland, on condition that he should be his "fellow-worker by sea and land." He was mortally stabbed by an outlaw at Pucklechurch, Gloucestershire, May 26, 946, and was buried at Glastonbury. Edmund's military victories and reforms in church and state gained him the names of the Deed-doer and Magnificent. His

sons, Edwy and Edgar, became kings after his brother Edred.

**Edmund** (c. 1175–1240). English saint and archbishop, known as Edmund Rich. Born at Abingdon, after studying and lecturing at Oxford and Paris he became in 1222 treasurer of Salisbury. He preached the Crusade in England, 1227, and on the nomination of Gregory IX was elected archbishop of Canterbury, 1233. Edmund vainly endeavoured to persuade Henry III to get rid of his foreign favourites, and was equally unsuccessful in establishing discipline amongst the monks at Canterbury, and in his protest against the provision of English benefices for Italian clergy. Finally in 1240 Edmund withdrew to France, where he died at Soissy. He is buried at Pontigny, and was canonised 1247. His festival is kept in the R.C. Church on Nov. 16, the day of his death. A college is dedicated to him at Ware. There are Lives by F. de Paravicini, 1898; B. Ward, 1903; M. R. Newbolt, 1928.

**Edmund Ironside** (c. 981–1016). King of the English. A younger son of Ethelred the Unready, he appeared in public about 1015. He was ruling Mercia, evidently as an under-king, when Canute invaded the land. Edmund raised an army, but was forced into Northumbria, and the war was raging when Ethelred died. Edmund was chosen king in London and Canute at Southampton, and the war between them was continued more fiercely than before. In Somerset the English king was victorious, and after a protracted battle at Sherston, Wilts, he was left master of Wessex. He then fought battles to relieve London from the attentions of Canute, but then followed the terrible defeat at Assandun. After this the two kings met and decided upon a division of the kingdom, but Edmund had not reaped the benefit of this when he died in London, Nov. 30, 1016. He was buried at Glastonbury. He won his nickname by personal bravery and his one year's fighting record.

**Edmundston.** Town of New Brunswick, Canada, at the junction of the Madawaska with River St. John, on the Canadian Pacific and National rlys. A bridge over the St. John connects with the state of Maine, U.S.A. It is the centre of a lumbering and farming district, and industries include pulp and paper mills and the C.N.R. shops. Pop. 7,096.

**Edom.** District situated to the S. of Palestine. It stretched from

the Dead Sea to the Gulf of Akabah, covering an area of about 100 m. by 20 m. The name Edom (red) is probably derived from the prevalent red sandstone of the district. Its first recorded inhabitants were a cave-dwelling race known as the Horites, who were conquered by Esau and his sons. During the Exodus, the inhabitants of Edom refused to allow the Israelites passage, and hence arose a feud which lasted till the end of the second century B.C. Both David and Solomon defeated them, but in the reign of Jehoram they threw off the yoke. Amaziah and Uzziah again subdued them, but after the fall of Judah they again became free till the days of the Maccabees, when they were finally crushed and forcibly proselytised by John Hyrcanus. The Edomites were polytheistic in religion, and marriages between their women and the Hebrews were a frequent source of trouble. The Herods were of Edomite origin. *See* Palestine.

**Edred** or **EADRED** (d. 955). King of the English. Youngest son of Edward the Elder, he succeeded his brother Edmund, May

26, 946, receiving the submission of Northumbria, the Scots, and the Welsh. In poor health, he left much of the administration to his mother and S. Dunstan, but led expeditions against his northern vassals and imprisoned Wulfstan, archbishop of York, for encouraging them. He also fought against his father's old enemy Anlaf. He died at Frome, Nov. 23, 955, and was buried at Winchester.

**Edremid.** Variant spelling of the port of Asiatic Turkey better known as Adramyti (*q.v.*).

**Edström, DAVID** (1873–1938). Swedish-American sculptor. Born at Hvetlanda, Sweden, March 27, 1873, he went at an early age to the U.S.A. with his family. At 13 he was a newsboy, later a factory hand, and at 21 decided to study art. He worked his passage to Sweden, where he became a student at the Royal Academy in Stockholm. Edström made portrait busts of members of the Swedish royal family. One of his most famous works was the Montreal war memorial. He published his autobiography, *The Testament of Caliban*, in 1938, and died at Los Angeles on Aug. 13 that year.

## EDUCATION: ITS THEORY AND PROBLEMS

Sir Fred Clarke, M.A. (Oxon.), Director, Institute of Education, 1936-45

*The general theory and the broadest aspects of education are considered in this article. The subject is treated in more particular detail under School; University, etc. See also under such headings as Co-education; Further Education; Technical Education; Grammar School; Modern School; Public School; County College*

Mankind, since it began to think at all about human concerns, has never ceased to give much anxious thought to the education of the young. Hence a rich store of wisdom on this great matter has accumulated, much of it still relevant to current needs.

In the course of history there occur periods when criticism of inherited ideas and practices gathers unusual strength. Men become conscious, often all too slowly, that times have changed, and that the methods and ideas of their fathers for the upbringing of children are not necessarily relevant to the changed conditions of their own time. Then the usual danger is reversed. Instead of accepting too uncritically whatever tradition dictates, men in their eagerness to reform run the risk of rejecting elements of tradition which still have real value.

The present is such a time. Criticism of traditional ideas and methods was certainly never more active. There is hardly a country where the critics are not heard, all saying much the same things.

The best thought is trying to state the answer for the present age to a question that has arisen in all ages of history, though men have not always been so acutely aware of it as they are today. It is a question of finding the right balance between what look like two distinct aims of education, aims which may seem to be in conflict with each other. These are: (1) The full development within the individual of all the powers and capacities with which nature has endowed him. (2) The production of a type fitted to live in a given society and to serve its needs.

These two aims can be summarised as: Fullness of Life and Fitness for Membership. If, as sometimes it seems, they are real contradictories, so opposed that the pursuit of one excludes the pursuit of the other, then the lot of man is melancholy indeed, for it would mean (as Rousseau sometimes thought) that he cannot be fit for social membership without sacrificing his individuality, nor of achieving full

individuality except (as some have maintained) by sacrificing social membership and living the life of a hermit.

Stated thus baldly, the alternatives seem grim; but much educational discussion seems to accept them, even if unconsciously, as absolute and final alternatives, and much practice seems to assume that one or the other must be chosen.

It is not possible to escape from the dilemma by formal appeals to the principles of democracy. For democracy is not ultimate. It is rather an expression of a choice of ideals already made, and experience and history show that democracy itself can be totalitarian, that it can place all the emphasis in education upon producing the type, and restrict very narrowly scope for individual development. Conversely, a non-democratic order can be so mild as to provide much scope for the free development of the individual. There are abundant examples in history of the emergence of most brilliant persons, highly individualised, from education under despotic regimes. Nevertheless, the choice between freedom and discipline, both in education and in the affairs of society at large, does seem to present itself acutely in a world where the problem of maintaining social order in peace and justice and free cooperation becomes increasingly difficult.

#### Revising Old Ideas

The solution of the difficulty must be found in a growing realization that the present is a new era in human experience and that thought about education, as about so much else, should not so much reject old ideas as revise them, bring them under critical review in the light of current experience. Thus it may be possible to achieve a restated doctrine of education that will meet the needs of a new age.

In the relatively small custom-ridden communities of a former age, this problem hardly presented itself. The pattern of life and belief was so firmly fixed, so universally accepted, and so little changing, that the plan of a child's education was clear. He learned to tread the way of his fathers simply by sharing, as he grew up, the traditional life of home and village and tribe.

It is important to realize that, until recently, this conception of the nature and purpose of education was general among

mankind. Only here and there and occasionally, as in the Greek city states and in Europe at the time of the Renaissance, did profound social change shake a few intelligent and critically disposed men out of the rut of tradition to think out the problem of education from first principles. Plato among the Greeks, and to a less extent Erasmus in the Renaissance, come to mind as examples.

#### Conditions Rapidly Changing

Now, in the mid-20th century, the kind of task which they attempted is, in effect, forced upon everyone. Also it will have henceforward to be repeated at not very long intervals, since, although the basic principles of education may remain the same, the conditions in which they are to be applied change rapidly. In a word, education, like everything else, has now to be planned and constantly replanned. An age of full critical self-consciousness has succeeded to the long age of traditional acquiescence.

When society is in a state of continuous change and movement, it is inevitable that individuals should become conscious, often painfully conscious, of themselves as such. They are then apt to conceive of society not as a necessary support and guarantee of their personal existence, but as something alien, and even hostile, pressing upon them from outside. This feeling of conflict, often now so acute, not only complicates the practical task of education; it also sets a problem for educational theory. In this way some understanding of the forces which have brought western culture to its present condition is necessary both for the intelligent guidance of educational practice and for the balanced statement of educational theory to explain and justify it.

The most important of these forces are all those powerful influences that can be grouped comprehensively under the term science, including both the organized mode of thought that is characteristic of the present world, and the systematic knowledge, with its many practical applications, that has resulted from the exercise of it. Science accounts for the vast increase in the pace of change. Major changes in men's way of life occurred, in the past, only at long intervals; the interval now may be shorter than a man's lifetime. Hence sociologists point significantly to what they term the "lag," the

much slower pace at which habits, ideas, and ways of thought change in response to the material changes wrought by science.

Science has also vastly increased the range from which influences come to affect the life of the ordinary man. His effective environment may now be the whole earth, and there are signs that a broad common culture, with varied local and regional forms, may include all mankind. A strong impulse to international organization, economic, social, cultural, and political, shows how the "lag" is being reduced.

Again, within the national society, the effect of science is to increase specialisation and division of labour. This sets up conflicts and tensions between the various group-interests and puts a growing strain upon social cohesion. When the strain is severe and the compensating forces making for unity are not strong, the conditions become favourable for a totalitarian order. Men may be driven to acquiesce, feeling that if social cohesion goes, everything goes. (There is no convincing evidence that the progress of science is necessarily favourable to democracy.)

#### The Right of the Strong

With the decay of a common basis of belief may go commonly accepted moral standards. Here, again, is a factor making for totalitarian order. If there is to be no right but that of the stronger, then the strong must impose their will upon all the rest, since apart from observance of common rules of conduct no society not based on the imposition of the will of the stronger can continue to exist. Other influences making in the same direction are the reaction against the over-exposure and the sense of loneliness that accompany excessive individualism, and the release that comes to some people when they swallow a creed whole and abandon the responsibilities of independent judgement by accepting the judgement of a leader.

It is not therefore surprising that the governing issue in all educational theory and practice becomes the choice between fullness of life and fitness for membership. The issue is essentially modern, arising from the same conditions that produced modern democracy. The first to state it clearly was Rousseau in his *Émile* (1762). He made no attempt to reconcile the clash: instead he rejected passionately the idea of



educating for some predetermined membership, and in what was really a kind of novel, told the story of the education of *Émile* by nature, that is, in effect, by a process of supervision and guidance under a tutor which had as its sole purpose the full and free development of all that was potential in him at birth.

#### Conforming to Pattern

The 20th century has experience of national communities where education is designed to ensure fitness for membership, a set pattern of beliefs, ideas, and habits to which all must conform. The same phenomenon in principle is found wherever education is inspired by the motive "catch 'em young": where conformity to a predetermined pattern is preferred to the more adventurous free development of individual potentialities. It can be detected even in family tradition, where a son is destined and trained from infancy to follow in the footsteps of his father.

By contrast, and particularly in England and the U.S.A., examples of the opposite conception can be found: "free" schools exercising very little discipline of the customary kind, but attempting to evoke and develop all the powers with which the child has been endowed by nature. Such schools are apt to underestimate the extent to which they also are subject to the shaping influences of the community, its beliefs and standards, its institutions and customs. Nevertheless, they do important service by their emphasis upon the alternative conception, and when, as is generally the case, they are conducted upon enlightened lines, they yield a valuable harvest of knowledge about child nature in its many diversities.

But the central question for educational theory remains: Is the clash of aims real and final? Is the choice necessarily between fullness of life and fitness for membership? Further, and of vital importance, is there a real choice at all? Since, as many urge, the more the claims of the individual are stressed, the less he seems to matter, the less his personal development seems to be generally possible, is not social solidarity the only effective governing value in practice?

It is necessary to draw a sharp distinction between appearance and principle; to avoid confusing the particular phenomena peculiar

to a given age or condition of society with the abiding principles of human education as such. In certain communities and at certain periods of history, the education that would have produced the approved standard type of citizen would have necessitated the distortion and misdirection of the natural development of the individual. Rousseau's *Émile* was, in fact, a protest against this very thing. The same kind of situation may occur in almost any society. Thus, as is well known, prevailing custom or fashion may even call for some physical deformation of the human body. In all cases where there is a conflict between social and individual purpose in education, the reason is to be found in some defect of society itself; and since no human society is perfect there will always be some measure of conflict in actual fact.

This, however, is a different thing from treating the distinction as a matter of principle, and so speaking as though every child has to be given two educations, one for himself as an individual and one for the human unit that is to become a citizen.

#### The Idea of a Common Humanity

One way of escaping the difficulty might be to deny that there is any such thing as a common human nature; to deny, that is, that man, simply as man, is a notion having any real concrete meaning at all. Then it would be necessary to say that man is merely whatever circumstances and the pressure of society make of the quite neutral material which is all that nature provides in the new-born infant. It is, however, only in movements of fanatical passion like that of Nazi Germany that the idea of a common humanity is denied. The idea has had a long history. Though it was for Christianity to enunciate it in a most thorough-going and unqualified form, it can be traced very plainly in the Hebrew prophets, and the Stoic philosophy of ancient times held it as a fundamental tenet. In modern times it has become a central theme of world-history, and perhaps within a measurable distance of time the idea of a common humanity, with its associated ideas of rights and claims, will be consciously held by all mankind and applied as a criterion to test the justice of measures of government and education alike. The underlying principle of such documents as the Atlantic Charter and the Charter

of the United Nations can hardly be interpreted in any other sense.

If, then, the seeming conflict between social and individual education is not to be evaded by denying the human claims of the individual, the conflict has still to be resolved.

There can be no doubt about the answer. It is impossible, in the last resort, to believe in a universe so constituted that, in order to become a social being, man is compelled to sacrifice or to distort some or all of his native impulses and attributes as an individual. As a distinguished American writer (W. E. Hocking) puts it: "Sociality is structural, not adhesive," *i.e.*, men and women do not just become social by an added training that may be doing violence to their individual "nature." To be social is itself part of human nature, and human beings cannot be fully individualised except as social beings.

Hocking puts the point in another formula in educational terms when he says: "Education must communicate the type [*i.e.* the type called for by the given social and cultural situation] and must provide for growth beyond the type." In other words, individual human values are still sovereign, and society stagnates and withers apart from the constant revitalising that issues from criticism by creative individuals. Society's supreme interest, therefore, is to remain open at the growing end, as it were. Its growing end consists of just these creative individuals, but they could not emerge at all except as social beings who have first assimilated the existing values of their society and then grown beyond them. These new or enriched values have the status of a real discovery, analogous to, say, a scientific discovery. They reveal further possibilities in the development of man. Take, for instance, the discoveries made regarding the value of free activities for young children and the factors that determine healthy physical growth.

#### A Valid Philosophy

Discoveries continue to be made. In so far as they are valid at all, they are valid for man as such, and it is for this reason that they become accepted. In spite of appearances the conclusion is, therefore, that there really is discoverable a philosophy of education that is valid for all mankind, and present tendencies towards intercommunication,

centres of international study of education, and nation learning from nation, show that belief in such a common philosophy is increasingly accepted. Its further development and acceptance can only be hampered by continued emphasis upon a false antithesis between individual development and effective social membership.

In educational practice, the line of advance for all peoples who are free to take it seems now to be fairly clear. On the public side the movement is towards more coherent and comprehensive rational planning, designed for the conscious use of education as a supreme instrument of social control. "Free" societies seek to achieve this by means which afford scope for the spontaneous action of "voluntary" groups and communities, while securing broad equality of opportunity in the interests of society and the individual alike. Great Britain's Education Act of 1944 is a striking example of such an attempt. On the side of the individual there is a complementary movement to diversify the forms of education provided and to relax the rigidities of school organization so as to find and apply that form of educational treatment that is best calculated to realize the possibilities, great or small, of each pupil. Belief in some degree of educability in even the weakest and most handicapped grows steadily stronger.

#### Research into Problems

Accompanying and supporting all this is a powerful movement to promote research into educational problems. It is realized that the achievement of such purposes calls for the establishment of a body of knowledge about education that, on the analogy of medical knowledge, might well be described as "clinical."

The driving motive behind these two complementary tendencies is more than the obvious democratic urge. There is also the awakened sense of the need to conserve, develop, and train all the human resources of the nation, wherever these may be found—another instance of the coincidence of the social with the individual purpose. In such a situation growing co-ordination of education with social policy may be effected. While there will be no diminution in the importance of the school (rather the contrary), there will be growing realization of the truth that all the agencies and activities of society are in some way or

other involved in producing the desired result: a human being who is at the same time a developed individual and an effective citizen. Finally, there are ultimate educational aims. There is general agreement that all alike must be enabled to achieve the highest possible level of knowledge and skill, that all are entitled to the highest level of attainable well-being.

#### Code of Traditional Conduct

In the moral field, a code of traditional conduct is still widely enough accepted to ensure the day-to-day continuance of the social routine; but at the deeper levels of basic beliefs there is probably less agreement than at any other time in human history. Yet it is at this level that the ultimate sanctions of conduct operate. Surface conventions can hold things together in normal times, but they may lose their hold in times of crisis; and in the absence of the deeper sanctions of common basic beliefs about man's life and destiny, social disintegration may result.

If, as many believe, the real danger to society lies here, then here also is found the ultimate problem of education. Perhaps it is at present all too little regarded, too much reliance being placed upon sheer organization, upon increase in knowledge, and upon practical efficiency in the educational process.

If, however, the perennial problem of man is that of rising superior to his own creations and inventions, if every fresh conquest of nature means a new demand upon his moral resources, then the continued enhancement and consolidation of those resources provide the supreme problem, social as well as educational. Failure to solve it where alone it can be solved effectively, in the moral control of the individual by himself, means at best the forcible imposition of control from outside, or at worst, sheer dissolution. Signs are accumulating that the issue cannot much longer be evaded. If this is so, then the ultimate problem of education is clear enough, and the philosophy of education must deepen its foundations accordingly.

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F. Clarke, 1940; The Future in Education, R. Livingstone, 1941; The Social Psychology of Education, C. Fleming, 1944; Education: Its Data and First Principles, T. P. Nunn, 1945; Total Education, M. L. Jacks, 1946.

**Education.** MINISTRY OF. Government department established by the Education Act, 1944, as the legal successor of the board of Education, constituted in 1899. It is the duty of the minister "to promote the education of the people of England and Wales and the progressive development of institutions devoted to that purpose and to secure the effective execution by local authorities under his control and direction of the national policy for providing a varied and comprehensive educational service in every area." Whereas the president of the board of Education could claim to be consulted by local education authorities, could advise them, and could partially control them by withholding grants from central funds, the minister of Education has statutory power to direct local authorities to act in order that a national policy is carried out. A central advisory council for education for England, and another for Wales and Monmouthshire, appointed by the minister, advise him upon "such matters connected with educational theory and practice as they think fit and upon any questions referred to them by him." The minister has to report annually to parliament on the work of the ministry and of these advisory councils. R. A. Butler, who piloted the Act through the house of commons, and from whom it took its name, was the first minister of Education.

Education in Scotland is supervised by the Scottish Education department, under the general control of the secretary for Scotland. An Education (Scotland) Act was passed in 1946, applying to Scotland provisions similar to those of the Education Act, 1944. N. Ireland has its own ministry of Education, under the control of the N. Ireland parliament.

**Education Acts of GREAT BRITAIN.** Acts passed to improve at public expense the general state of education. Government intervention in education began in 1832 when parliament made a grant of £20,000 for school buildings to the British School Society and the National Society. The Elementary Education Act of 1870 (Forster Act) set up elected school boards, with power to raise money from local rates, in districts where school

accommodation was insufficient. An amending Act of 1876 made it the duty of the parent to see that every child received elementary instruction in "reading, writing, and arithmetic." An Act of 1880 required local authorities to enforce attendance. The Technical Instruction Act of 1889 empowered councils to levy a rate not exceeding a penny in the £ in aid of technical instruction; the Local Taxation Act of 1890 allowed the use for technical instruction of the imperial contributions paid to local authorities for the beer and spirit duties. This so-called "whisky-money" greatly helped the establishment of technical colleges throughout the country. An Act of 1899 set up the board of Education. The Education Act of 1902 (Balfour Act) abolished school boards, and made the county or county borough the authority for all forms of education, a special Act dealing with London being passed in the following year. The Education Act of 1918 (Fisher Act), re-enacted by the Education (Consolidation) Act of 1921, gave wide powers to local education authorities to provide adequately for the physical, as well as mental, welfare of children of all types from two years old. It raised the school-leaving age from 12 to 14, and gave the local authority power to raise the age to 15, a power never acted on.

#### The Butler Act of 1944

The Education Act of 1944 (Butler Act) revolutionised the English educational system. It established a ministry of Education (*q.v.*); it unified the control of all forms of education within each area; it provided for a unified statutory system of public education, organized in three progressive stages known as primary, secondary, and further; it sanctioned the raising of the school-leaving age to 15, and subsequently to 16; it provided for the establishment of county colleges, at which adolescent workers up to 18 years of age must attend for the equivalent of one day a week; it abolished fees for secondary education in publicly financed schools; and it contained schemes for a vast expansion of educational services of many kinds, including those for adults. An amending Act (1946) clarified a few points in the main Act, and also removed the ban on membership by teachers of certain public bodies.

**Edward.** Masculine Christian name. Of Teutonic origin, it means able to guard. It was popular

among the Anglo-Saxons, being borne by Edward the Elder, Edward the Confessor, and other kings, and has since been one of the most used of English names. The Anglo-Saxon Edward is sometimes spelled Eadward, a form which gives the best idea of the diphthong with which it began in that tongue. Eduard, Edouard, and Edoardo are respectively the German, French, and Italian forms.

**Edward, LAKE,** formerly Albert Edward Nyanza. Lake of East Central Africa, 150 m. W. of the Victoria Nyanza. Lying at an alt. of 3,000 ft. above sea level, it is connected on the N.E. by a tortuous channel with Lake George. The latter was discovered by H. M. Stanley in 1875, who believed it to form part of the Albert Nyanza; but, while tracing the source of the Semliki river in 1889, he discovered the lake he named Albert Edward Nyanza, and also the channel connecting it with Lake George. The length of Edward Lake is 44 m. and the breadth 33 m.

**Edward THE CONFESSOR** (c. 1005-66). King of the English. The son of Ethelred the Unready



Edward the Confessor. His great seal, the earliest known specimen

and Emma, daughter of Richard, duke of the Normans, he was born at Islip, Oxon. He was taken to Normandy by his parents when Sweyn became king in 1013. Invited to England in 1041 by his half-brother, Hardicanute, when the latter died in the following year Edward was chosen king, and placed on the throne largely by the help of Earl Godwin, whose daughter Edith he married in 1045.

Edward, who was probably an albino, had the unusual qualities for a Saxon king of abstemiousness, kindness, and humility, and was long remembered in affection; but he was scarcely an effectual ruler. His reign was peaceful, though marked by struggles for power between the English and the Normans, the latter being be-

friendred by the king. Edward's chief interest was religion, and he devoted a large part of his revenues to the erection of Westminster Abbey. It was consecrated Dec. 28, 1065, and Edward died Jan. 5, 1066. He was canonised in 1161, and his festival is kept on Oct. 13. *Consult* Lives of Edward the Confessor, ed. H. R. Luard, Rolls Series, 1858.

**Edward THE ELDER** (d. 924). King of the English. The son of Alfred the Great, he fought with him against the Danes. He was called king before his father's death, and in 901 the witan chose him as Alfred's successor. His succession was disputed by his cousin Ethelwald, who rebelled and was slain in battle in 905. By 918 Edward brought the Danes into subjection; in 919, on the death of his sister Ethelfleda, he absorbed Mercia; and in 921 he subdued the Welsh. He ruled as far north as the Humber, and his overlordship was acknowledged by all the other kings. The "unconquered king," as Florence of Worcester calls him, died at Farndon, Northants, and was buried at Winchester. His son Athelstan succeeded him.

**Edward THE MARTYR** (c. 963-978). King of the English. The son of Edgar, his right to the succession was disputed on Edgar's death in 975 by his stepmother Elfrida, who put forward her son Ethelred (the Unready). Edward was supported by Archbishop Dunstan, and was crowned. On March 18, 978, he was assassinated at Corfe Castle by Elfrida's orders, while being offered a drinking-cup, and was hastily buried at Wareham. In 980 his body was transferred to Shaftesbury, and his tomb became a place of pilgrimage. He was long revered as saint and martyr, his festival being kept on March 18.

**Edward I** (1239-1307). King of England. The eldest son of Henry III, he was born at Westminster, June 17, 1239. In the differences between the crown and the baronage, Edward sided with his father, and was taken prisoner after the battle of Lewes, May 14, 1264. He escaped, however, and directed the royalist victory over Simon de Montfort at Evesham, Aug. 4, 1265. He succeeded to the throne



Edward I, King of England, 1272-1307

in 1272. During his reign, Edward conquered Wales, and endeavoured to form a united kingdom embracing the whole island by asserting his sovereignty over Scotland, which regularly rebelled whenever the king was seriously engaged elsewhere. Edward was at the head of an invading army when he died, July 7, 1307, at Burgh-on-Sands.

Edward ranks as one of the greatest kings of England. He systematised the English laws, and gave the English parliamentary system its definite form by summoning to the Model parliament of 1295 not only the higher clergy and baronage, but knights and burghers. His tomb in Westminster Abbey bears the inscription, *Malleus Scotorum*, "the Hammer of the Scots," and his motto, *Pactum serva*, Keep troth. Edward's first wife was Eleanor, daughter of the king of Castile; his second was Margaret, daughter of Philip of France. *Consult* E. I. T. F. Tout, 1893; Welsh Wars of E. I. J. E. Morris, 1901.

**Edward II** (1284-1327). King of England. Son of Edward I, he was born at Carnarvon, April 25, 1284. In 1301 he was created prince of Wales at Lincoln and he acted as regent when his father



Edward II,  
King of England,  
1307-27

was away; however, he early revealed the indolence and levity that finally destroyed him. In 1306 he was given the province of Gascony, and in 1307 he became

king. He abandoned the war against Scotland, and was married to Isabella of France.

Edward was already under the influence of Piers Gaveston. The barons took up arms with Edward's cousin, earl Thomas of Lancaster, at their head, and they forced upon the king the banishment of Gaveston. A reconciliation, brief and insincere, followed. In 1314 the Scotch war was renewed and Edward suffered defeat at Bannockburn. This was Lancaster's opportunity, and for a time the king was a cipher, but he found fresh favourites in the Despençers, and a combination of circumstances brought about the defeat and death of earl Thomas in 1322. Edward and the Despençers were then supreme until 1326. Isabella, alienated from her husband, crossed from France with some followers. Caught in Wales, he was formally deposed, and on Sept. 21, 1327, he was murdered at Berkeley Castle

Consult Place of the Reign of Edward II in English History, T. F. Tout, 1914; see Carnarvon illus.

**Edward III** (1312-77). King of England. Born Nov. 13, 1312, he was raised to the throne by the deposition of his father, Edward II (Jan., 1327). The government was in the hands of the queen-mother Isabella and Roger Mortimer till the young king, who married Philippa of Hainault, 1328, overthrew them by a *coup d'état* in 1330.

At first Edward warred against the Scots, but his ambitions were soon turned to France, and in 1338 began the Hundred Years' War. In the course of it he secured the English supremacy of the narrow seas by the naval victory of Sluys, June 24, 1340, established the prestige of the English soldiery and the military supremacy of the English archers by the startling victory of Crécy, Aug. 26, 1346; and in 1347 captured Calais. A victory was won by his son Edward the Black Prince at Poitiers, Sept. 19, 1356, and Edward was confirmed in the independent sovereignty of Aquitaine by the treaty of Brétigny in 1360. He died, prematurely senile, June 21, 1377. His family included the dukes of Clarence, York and Lancaster, whose descendants fought for the crown during the Wars of the Roses. He was the first king who conspicuously directed policy to commercial expansion, the security of the trade with Flanders being one of the objects of his French wars. *See* Lives, W. Longman, 1869; W. Warburton, 2nd ed. 1876; J. Mackinnon, 1900.

**Edward IV** (1442-83). King of England. The eldest son of Richard duke of York, and Cicely Neville, he was born at Rouen, April 28, 1442. In Dec., 1460, he became the leader of the Yorkists and their candidate for the crown. Acting with great energy, he crushed the Lancastrians at Mortimer's Cross, and in London was hailed as king. He then seated himself on the throne at Westminster on March 4, 1461.



Edward III,  
King of England,  
1327-77

After a victory at Towton Edward was able to hold his own, although not absolutely secure. In 1469, however, came a change. He had made many enemies by the favour he showed to his wife's kinsfolk, the Woodvilles, and when Warwick and Clarence, the king's brother, joined his foes, his position was precarious. He prepared to meet them in the field, but the desertion of 6,000 men was fatal to his cause, and in great haste he left Lynn for the Netherlands. Returning with an army, he won battles at Barnet and Tewkesbury. In 1475 he conducted a short war with France and he had some trouble with Scotland, but in general he kept the land at peace. He died April 9, 1483. *Consult* Life and Reign, C. L. Scofield, 1923.

**Edward V** (1470-83). King of England. He was born in the Sanctuary, Westminster, Nov. 3, 1470, a son of Edward IV and Elizabeth Woodville. When he succeeded to the throne, April 9, 1483, his uncle, the duke of Gloucester, was his guardian. *See* Richard III.



Gloucester, however, imprisoned the boy king and his brother in the Tower, and had himself crowned as Richard III, July 6, 1483. According to Sir Thomas More, endorsing contemporary belief, Edward and his brother were murdered very shortly after. *See* Richard III.

**Edward VI** (1537-53). King of England. He was born at Hampton Court, Oct. 12, 1537, the son



Edward

of Henry VIII and his third wife, Jane Seymour, and succeeded to the throne, Jan. 28, 1547. His uncle, the duke of Somerset, was protector and the real ruler for the first half of the reign, and on Somerset's fall and execution, to which the young king calmly assented, his rival, the earl of Warwick, later duke of Northumberland, held the chief power. The young king favoured Northumberland's plan for securing the succession of his daughter, Lady Jane Grey. Edward died at Greenwich, July 6, 1553. *See* King Edward VI: an appreciation, C. R. Markham, 1907.



Edward VI

**Edward VII** (1841–1910). King of Great Britain and Ireland and of the British dominions beyond the seas, and emperor of India. Albert Edward, second child and eldest son of Queen Victoria and Prince Albert, was born at Buckingham Palace, Nov. 9, 1841, and created prince of Wales the following month. His education, planned by his father on severe and rigid lines, made his boyhood a weariness and his adolescence a struggle for emancipation. Following private tutoring, he studied science at Edinburgh and became a student first at Christ College, Oxford, then at Trinity, Cambridge, but took no degrees. To the end of his life he preferred to learn from his inexhaustible interest in living men and women rather than from books. The most rewarding part of his education was afforded by travel. In 1859 he went to Italy and Spain, in 1860 he toured Canada and the U.S.A., and in 1862 he visited the Holy Land.

In 1863 he married Alexandra, daughter of Prince Christian of Glücksburg, heir to the throne of Denmark. Thenceforward until his accession in 1901 he resided at Marlborough House. The Sandringham estate, in Norfolk, was bought for him out of the money saved during his minority. During this period he performed such lesser representative functions as Victoria, with her preference for personal retirement in the years of her widowhood, felt herself unable to face. But until he was over fifty years old the Queen consistently declined to allow him to participate in affairs of state or even to afford him access to important dispatches. Thus his wide political knowledge, acquired externally by intercourse with politicians of all nations, lacked scope for action. The prince and his wife became the acknowledged leaders of London society, his duties also brought him into touch with people of every social grade, and his popularity was firmly established. He became a member of a royal commission on the housing of the poor, and took a particular interest in the cause of the London hospitals, an interest to some extent due to his own grave illness from typhoid in 1871. He was grand master of English freemasonry 1874–1901. In 1875 he visited India, laying a foundation for later relations between that empire and the British crown.

Despite his popularity, he was not exempt from criticism: first

for his love of the turf (he won the Derby in 1896 with Persimmon, 1900 with Diamond Jubilee, and 1909 with Minoru), but more generally for what seemed to some a tendency to select his friends from those who shunned the sterner walks of life. Criticism came nearest to a head in 1891, after the Tranby Croft baccarat case, a lawsuit following a game of cards at which the prince, who had been banker, appeared as a witness. But the incident was overlooked in the widespread sympathy expressed six months later on the death of his eldest son, the duke of Clarence, Jan., 1892.



*Edward VII*

Edward succeeded to the throne in his sixtieth year, and reigned only nine years, during which his health required increasing care. His coronation, fixed for June 26, 1902, was postponed at short notice by an operation for appendicitis, his second serious illness, though he recovered in time to go through a shortened ceremony on Aug. 9. Yet during his brief reign he evinced a more ready aptitude for kingship than had been generally expected. In 1903 he paid a series of European visits devoted to strengthening friendship with France, Italy, and Portugal, in the first case setting the seal of his personality on the establishment of the *entente cordiale*. Three visits to Ireland were made with a similar object, and later he went twice to Germany, whose emperor bore public testimony to his uncle's "unremitting endeavours" in the cause of peace. His diplomacy averted war between Sweden and Norway in 1905. All these activities earned him in his own lifetime the sobriquet of

Edward the Peacemaker. At home, while revealing a clear appreciation of the functions of a constitutional sovereign, he did much to consolidate the personal dignity of the monarch, restoring most of the brilliant pageantry associated with the court which had lapsed under Victoria.

He died at Buckingham Palace, May 6, 1910, following an attack of bronchitis, and was buried May 20 in St. George's Chapel, Windsor. Nine sovereigns attended his funeral: his son George V, the German emperor, and the kings of Spain, Portugal, Norway, Denmark, Belgium, Greece, and Bulgaria. Five of his children survived infancy: Albert Victor, duke of Clarence (1864–92), George V (*q.v.*), and the princesses Louise (1867–1931), Victoria (1868–1935), and Maud (1869–1938), queen of Norway. The statue of Edward in Waterloo Place, London, is one part of the national memorial, the other being Shadwell Park.

Edward's short reign has given the name "Edwardian" to a recognizable period, suggesting in retrospect the final golden effulgence of 19th-century prosperity, comfort, and security, projected into the first decade of the 20th century, and marked in social life as in the arts by a magnificent prodigality of display and decoration amounting at times to ornateness when judged by later standards: a period when the austerities of Victorian days were relaxed and the grimmer problems of later years had scarcely appeared above the horizon.

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**Edward VIII** (b. 1894). The eldest son of King George V was born June 23, 1894, and succeeded his father Jan. 20, 1936. He abdicated Dec. 11 the same year, after the shortest reign in England (327 days) since that of Edward V, and was granted the title of duke of Windsor. See Windsor, Duke of.

**Edward** (1330–76) known as the Black Prince. Eldest son of Edward III of England, he was born at Woodstock, June 15, 1330; in 1333 was made earl of Chester, four years later duke of Cornwall, and in 1343 prince of Wales. He accompanied his father on the French campaign and distinguished



Edward,  
the Black Prince  
From an old engraving

himself at the battle of Crécy, Aug. 26, 1346. He was at the capture of Calais, and in 1350 in the sea fight off Winchelsea against the Spaniards. In 1355 Edward

was sent to Gascony, when he led the English armies in a series of raids over the French territory. A similar expedition culminated on Sept. 19, 1356, in the battle of Poitiers.

In 1357 he returned to England and in 1361 married his cousin Joan, known as the Fair Maid of Kent. In 1362 his father granted him Gascony and Aquitaine. He took part in a disastrous expedition for replacing Pedro of Castile on the throne, but soon many disaffected lords of his territories rose against him and towns surrendered to them. When, after a month's siege, he retook Limoges, he ordered a general massacre of its inhabitants. In 1371 Edward returned, in broken health, to England. He supported the bishops against the evil administration of his brother Lancaster. He died at Westminster, June 8, 1376, and was buried in Canterbury Cathedral. He was not called the Black Prince until long after his death, the name being probably given him because he wore black armour. While Edward was a superb warrior and has been looked upon as a model of chivalry, his work was wholly unconstructive and his personal character deteriorated after about 1360. Richard II was his son. A *Life* by R. P. Dunn Pattison appeared in 1910. Maurice Baring wrote a poetic drama, *The Black Prince*, 1902. An imaginative bronze statue by Thomas Brock is at Leeds.

**Edward** (b. 1884). Duke of Saxe-Coburg-Gotha. Prince Charles Edward was born at Claremont, Esher, Surrey, July 19, 1884, as the duke of Albany, posthumous son of Duke Leopold, 4th child of Queen Victoria. He succeeded his uncle Alfred in 1900 as duke of Saxe-Coburg-Gotha, where he ruled until Nov., 1918. He had been a Prussian general, and after his abdication joined the Nazi movement and backed Hitler with part of his great wealth. The latter frequently used him for displaying the completeness with which his party embraced all social strata,

and made him a general of the party army. He represented Germany at the funeral of George V in 1936.

**Edward, THOMAS** (1814-86). Scottish naturalist. He was born Dec. 25, 1814, at Gosport, taken by his parents to Banff at an early age, and remained there for the rest of his life. A poor shoemaker, he for many years spent the whole of his nights out of doors. He discovered between twenty and thirty species new to science, adding to the British fauna a vast number of species hitherto unknown in these islands. In 1866 he was elected an associate of the Linnean Society, and a civil list pension was awarded to him. He died April 27, 1886. *Consult* *Life of a Scotch Naturalist*, S. Smiles, 1876.

**Edwardes, GEORGE** (1852-1915). British theatrical manager. He was born Oct. 8, 1852, of Irish parents, and started his career as business manager at the Gaiety Theatre, Dublin. In 1875 he became business manager for D'Oyly Carte at the Opéra Comique, London, and went with him to the Savoy. He joined John Hollingshead as joint manager at The Gaiety, London, 1885, and in 1886 became the manager of that theatre, which he directed for nearly 30 years, producing a long series of successful musical plays. He died Oct. 4, 1915.

**Edwardes, SIR HERBERT BENJAMIN** (1819-68). British soldier and Indian administrator. He was born at Frodesley, Shropshire, Nov. 12, 1819, and became a cadet in the East India Company in 1840. In 1845-46 he was aide-de-camp to Sir Hugh Gough in the Punjab campaign. As first assistant to Sir Henry Lawrence, the resident at Lahore, he administered Bannu, and his courage and resourcefulness were conspicuously seen in his defeat of the diwan of Multan, 1848. Edwardes rendered signal service during the Mutiny by securing the neutrality of Afghanistan. Knighted in 1860, he died Dec. 23, 1868.

**Edward Medal.** Medal instituted in 1907 by Edward VII to reward heroic acts by miners,



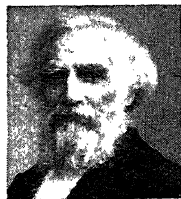
Edward Medal, instituted as a reward for heroic deeds in civil life (reduced)

quarrymen, etc., who have endangered their lives in rescuing others so employed. It consists of two classes, the Edward medal, and the Edward medal in silver. Bars are awarded for further acts. The medal bears a portrait of King Edward. The ribbon is dark blue with narrow yellow edge.

**Edwards, ALFRED GEORGE** (1848-1937). British prelate, the first Anglican archbishop of Wales. Born at Llanymawddwy, Merionethshire, Nov. 2, 1848, he was educated at Jesus College, Oxford, and, having been ordained, became in 1875 headmaster of Llandovery College. In 1885 he was made vicar and rural dean of Carmarthen, and in 1889 bishop of St. Asaph. In 1920 Dr. Edwards was elected first archbishop of the new province of Wales, although he had opposed Welsh Church disestablishment. He was in retirement from 1934, dying July 22, 1937. His *Memories* appeared in 1927.

**Edwards, AMELIA BLANDFORD** (1831-92). British novelist and Egyptologist. She was born in London, June 7, 1831, and for many years wrote stories for *Household Words* and *All the Year Round*, besides contributing articles to the *Saturday Review* and the *Morning Post*. A novel, *Barbara's History*, 1864, was translated into German, Italian, and French; Lord Brackenbury, 1880, ran into 15 editions. In 1882 she founded the Egypt Exploration Fund. She endowed the first chair of Egyptology at London. She died April 15, 1892.

**Edwards, JOHN PASSMORE** (1823-1911). British journalist and philanthropist. Born at Blackwater, Cornwall, March 24, 1823, son of a carpenter, he trained himself to be a journalist, coming to London in 1846. He was proprietor and director of the London

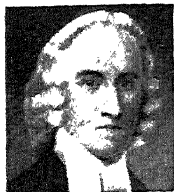


J. Passmore Edwards,  
British philanthropist  
Elliott & Fry

evening journal, the *Echo*, 1876-96, and sat as Liberal M.P. for Salisbury, 1880-85. Edwards is chiefly remembered for his benefactions to hospitals, libraries, art galleries, and other public institutions, of which he founded more than 70. The settlement in Tavistock Place, London, W.C.1, is now the Mary Ward Settlement. He died April 22, 1911.



**Edwards, JONATHAN** (1703-58). American divine and theologian. He was born Oct. 5, 1703, at East



Jonathan Edwards,  
American divine

Windsor, Conn., and in 1727 became minister at Northampton, Mass. His extreme and logical Calvinism was expounded with unusual power, but his insistence on church discipline brought dismissal from the pulpit. From 1750 he resided at Stockbridge as a missionary to the River Indians, and before his death, March 22, 1758, was appointed president of Princeton College. Edwards's most important book was *A Careful and Strict Enquiry into . . . Freedom of Will*, 1754. His works were edited by S. E. Dwight, 10 vols., 1830. See Calvinism.

**Edwin** OR **EADWINE** (c. 585-633). King of Northumbria. The son of Ella, king of Deira, he was driven from Deira after his father's death by the king of Bernicia, and took refuge with Raedwald, king of E. Anglia, who defeated and slew the Bernician king in 617. Edwin then annexed Bernicia and became king of Northumbria. In 625 he married Ethelberg, sister of the king of Kent. In 627 he was baptized by Paulinus and his kingdom became Christian. Edwin's overlordship extended over all Anglo-Saxon Britain except Kent, and his rule was notable for its justice and peace. On Oct. 12, 633, Edwin was defeated and slain at Heathfield, near Doncaster, in a battle against a coalition of heathens under Penda of Mercia and Cadwallon of North Wales. Edinburgh is named after him, and he was long venerated as a saint, his day being Oct. 4.

**Edwin and Angelina.** Simple ballad, sometimes called *The Hermit*, by Oliver Goldsmith. It was privately printed for the countess of Northumberland in 1765 and first published in *The Vicar of Wakefield* (1766), where it is introduced by way of contrast with the false taste and meretricious exuberance of language in the poetry of the time. It tells of the coming together of separated lovers. From this ballad the names have come to be applied to any loving young couple.

**Edwin Drood.** The full title of Charles Dickens's unfinished novel is *The Mystery of Edwin Drood* (q.v.). See also *Drood Controversy*.

**Edwy** OR **EADWIG** (c. 940-959). King of the English. Known as the Fair, he was the son of Edmund who was murdered in 946, and succeeded his uncle Edred who died Nov. 23, 955. He appears to have been a quarrelsome youth, offending his counsellor Dunstan, who was exiled, and driving the northern nobles to rebellion. He died Oct. 1, 959, was buried at Winchester, and was succeeded by his brother Edgar.

**Beckhout**, GERBRAND VAN DEN (1621-74). Dutch painter. Born at Amsterdam, Aug. 19, 1621, he was the favourite pupil and later the friend of Rembrandt. He painted genre pictures, portraits, and scriptural subjects, but his cabinet pictures are superior to those on a larger scale. Among his works which were in German galleries may be mentioned *The Raising of Jairus's Daughter*, *Tobit and the Angel*, *The Presentation of Jesus in the Temple*, *Jesus Among the Doctors*; and the portraits of Oliver Dapper, the geographer, and Rembrandt. He also executed etchings. Beckhout died at Amsterdam, Sept. 29, 1674.

**Becloo.** Town of Belgium, in the prov. of E. Flanders. It stands on the Liève, 11½ m. N.W. of Ghent. A rly. junction, it is connected also with neighbouring towns by tramways. It carries on a large trade in grain, and its manufactures include lace, woollen, and linen goods. Pop. 14,672.

**Eel** (*Anguillidae*). Group of fishes with elongated snake-like bodies and no visible scales. They are



Eel. The common eel found in both sea and fresh water

found in both sea and fresh waters in most parts of the tropical and temperate regions of the world. The common European eel (*A. anguilla*) is a familiar example.

The life history of the eel, long a complete mystery, was worked out by the Danish zoologist Johannes Schmidt. It is now known that the silver and yellow eels are not two varieties, but different stages in the life history. In autumn the mature silver eels migrate down the rivers to the sea, and those in ponds will often go overland for considerable distances at night to reach the rivers. Eels spawn in

the Sargasso Sea during winter, in deep water. The eggs hatch out as little fish known as *Leptocephali* or glass fishes, or elvers, so entirely unlike their parents that they were formerly thought to be a distinct species. They are flat, ribbon-like creatures about 3 ins. long, curiously deep in body, scaleless and transparent, with small heads. These *Leptocephali* do not appear to feed in the sea, and they gradually shrink both in length and depth, and become round in body, when they are known as glass eels. In this state they make their way up the rivers in countless millions. In ponds eels often live for several years before descending to the sea to spawn. They die after depositing their eggs. The grown male is smaller than the female.

Eels are used as food by most European nations. Most of those eaten in Great Britain come from Holland and Denmark. Before the First Great War the Germans had established a large elver-catching depot on the Severn.

With certain exceptions it is illegal to fish for eels with rod and line between March 14 and June 16. For the protection of salmon it is made illegal, with minor exceptions, to use an eel basket, net, or trap between Dec. 31 and June 25 in waters frequented by salmon or migratory trout. The ministry of Agriculture and Fisheries may make orders regulating eel and elver fisheries. See also *Conger*.

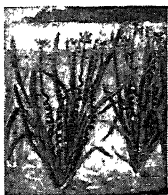
**Eel**, **ELECTRIC** (*Gymnotus electricus*). Large eel-like fish found in the rivers of Brazil and Guiana. Though resembling an eel in general appearance, it is widely removed from it in internal structure. It attains a length of 6 ft., and is notable for the powerful electric shock that it can give. The electricity is generated by four organs lying in pairs under the skin, but their precise mode of action is not fully understood. The animal uses this power for killing or stunning the fish on which it feeds, as well as in self-defence. The force of the shock varies greatly, but is sometimes so strong that it would overpower a horse. See *Electric Fish*.



Electric Eel. A large fish which can impart an electric shock

**Eel-grass** (*Vallisneria spiralis*). Perennial aquatic herb, member of the family Hydrocharitaceae.

It is a native of warm and temperate regions, including S. Europe. The short stem is immersed in the mud of rivers and lakes, and from it arises a tuft of thin grass-like leaves a yard long, but only  $\frac{1}{2}$  in. wide. The female flower has a very long spiral stalk which enables it to lie upon the surface of the water. The male flowers (produced by separate plants) have very short stalks which break away from their attachment, so that they float to the surface, where they pollinate the females. This accomplished, the female, by the spiral contraction of its stalk, is withdrawn to the bottom, where it develops into a cylindrical berry.



**Eel-grass.** Plants of the aquatic herb

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**Eel Pie Island.** Islet in the Thames opposite York House, Twickenham. Also called Twickenham Eyot, it has long been noted as a favourite resort of anglers and boating parties. The inn on the islet occupies the place of Eel Pie House, pulled down in 1830.

**Eel Pout** (*Lota lota*). Popular name for the burbot. It is a freshwater fish, common in European and American rivers, and in Great Britain found chiefly in the Cam and the Ouse. It is about a yard long, and somewhat eel-like in shape.

**Effendi.** Turkish title of respect. It is applied in the East to government officials, men of learning, and others. It is a corruption of the Greek *authentēs* (mod. pron. *authentēs*), a lord.

**Effervescence** (Lat. *effervesce*, to boil up). Name applied to the phenomenon of the rapid escape of gas from a liquid. It is usually the result of chemical action. A familiar example is seen in the mixing of a seidlitz powder with water. When soda water is withdrawn from a syphon the evolution of carbon dioxide is due to physical causes.

**Efficiency** (Lat. *efficientia*, a carrying out). Term meaning in general the quality of producing some desired result. Apart from its use in engineering, it is increasingly used in industrialism and economics, considerable attention being paid by doctors and others to the efficiency of the worker.

In engineering, efficiency is the ratio of the amount of energy given out from a conducting, converting, or transmitting device to

the energy received by it. In all cases the efficiency is less than unity, as some of the energy is dissipated or used up unprofitably. The efficiency of a joint is the ratio of the strength of the joint to a similar section of unjointed material. In aeronautics, where the main spars are spliced, the efficiency of the splice is its strength relative to that of the unspliced wood of similar section.

The heat-absorbing efficiency of a boiler is represented by the percentage of the heat units of the burnt fuel which is found in the water and steam. The efficiency in very good boilers may be as high as 80 p.c. The heat-converting efficiency of a steam engine is its capacity for converting units of heat energy into units of mechanical work on the basis of one thermal unit being equivalent to 778 foot-pounds of work. So much heat is wasted by conduction, condensation, etc., that the efficiency, even in the best engines, does not exceed 15 p.c. to 18 p.c. The brake or effective h.p. of an engine is less than the indicated h.p., owing to loss in overcoming friction. Similarly, the converting efficiency of a dynamo or electric motor respectively is its capacity for transforming mechanical into electrical, or electrical into mechanical energy. The difference between energy units received and delivered decides the transmitting efficiency of lines of shafting, belt drives, etc.

A good example of the cumulative effect of losses due to efficiencies being less than unity is afforded by the propelling apparatus of a ship. Assuming a boiler efficiency of 75 p.c., an engine heat-efficiency of 15 p.c., a transmitting efficiency of 90 p.c., and a propeller efficiency of 60 p.c.—all well above the average—out of 100 units of heat-energy developed by the burning of boiler fuel only  $(100 \times \frac{75}{100} \times \frac{15}{100} \times \frac{90}{100} \times \frac{60}{100}) = 6.075$  p.c. are converted into useful work. See Boiler; Steam Engine.

**Effigy** (Lat. *effigies*, image, likeness). Monumental effigies on tomb-lids in Christian churches from the 13th century onwards abound in England and W. Europe. Originally carvings in low relief, which gave rise to monumental brasses, they developed into figures in the round, usually recumbent. Ancestral effigies, kept in great houses in ancient Egypt and Rome, suggested to medieval Europe the funeral effigies placed upon the biers of royal and other personages.

In primitive culture effigies are important adjuncts of sympathetic magic. There are palaeolithic cave-portraits of food-animals, speared symbolically to ensure success in hunting. The piercing or melting of waxen images to induce sickness or death, practised in early Egypt, Babylonia, Vedic India, Greece, and Rome, prevailed in 13th-17th century Christendom. See Numismatics; Waxworks.



**Effigy.** Two examples in wax. Left: Effigy of Queen Elizabeth in Westminster Abbey. Right (by courtesy of Messrs. Tussaud): Effigy of Queen Marie Antoinette, originally shown at Versailles

**Effingham, EARL OF.** British title borne by the family of Howard from 1731 to 1816, and again since 1837. The family is descended from Lord William Howard, a son of the 2nd duke of Norfolk. He served Henry VIII and his three children and was in 1553 made Baron Howard of Effingham, in Surrey. His son Charles commanded the English fleet against the Spanish Armada and was made earl of Nottingham in 1596. The earls of Nottingham held the barony of Howard of Effingham until their extinction in 1681, when it passed to Francis, whose son Francis, 7th baron, was created earl of Effingham in 1731. In 1816 the earldom became extinct, and the barony devolved upon a kinsman, Kenneth A. Howard, created earl of Effingham in 1837. Mowbray, 6th earl, was born Nov. 29, 1905, and succeeded his father 1946. An eldest son is still known as Lord Howard of Effingham.

**Efflorescence** (Lat. *efflorescere*, to bloom). Term applied in chemistry to the changes which some crystals undergo when exposed to air. The surface of the crystals becomes covered with a fine powder, fancifully known as flowers. The change is due to the giving up of water owing to the higher vapour pressure of the crystal compared with that of the surrounding atmosphere. A familiar example is seen in washing soda, which, at first transparent, after exposure becomes opaque on the surface. The change is due to a reduction in the quantity of water of crystallisation normally present in the crystals. The word is also used in botany for the process of flowering. See Chemistry; Crystallisation.

**Effusion** (Lat. *effundere*, to pour out). Escape of a gas under pressure from the vessel in which it is enclosed, through a small opening. This escape will follow precise laws expressed by Graham as follows: "The velocity with which a gas effuses varies directly as the square root of the difference of pressure on the two sides of the opening (in the vessel and outside it) and inversely as the square root of the density of the gas."

**Efik.** Negro tribe in the Calabar coastland, S. Nigeria. They predominate between the Cross and Ikpan rivers, and, having long acted as middlemen between the white traders and the interior peoples, they are largely Christianised and Europeanised. Their speech is semi-Bantu.

**Eft.** Properly the newt (*q.v.*). The word is often loosely applied

to various lizards, which are reptiles and not amphibians as is the newt.

**Egan, PIERCE** (1772-1849). British sporting author. He spent his life reporting races, prize-fights,



Pierce Egan,  
British author  
After Sharples

cock-fights, cricket matches, trials, and executions. He achieved great popularity as the author of a series of sketches describing London amusements in Regency times and entitled *Life in London: or the Day and Night Scenes of Jerry Hawthorn, Esq., and his elegant friend, Corinthian Tom, accompanied by Bob Logie, the Oxonian, in their Rambles and Sprees through the Metropolis*. These were issued in monthly parts from 1821 and illustrated by I. R. and G. Cruikshank. Of his numerous other writings Pierce Egan's *Book of Sports and Mirror of Life*, 1832, was the best. He died Aug. 3, 1849.

**Egba OR EGBALAND.** District of Western Nigeria. It is situated N. of Lagos, and is surrounded by Ibadan, Ikorodu, Badagri, and Meko. Its area is about 1,869 sq. m. The native population consists of four local tribes known as the Egba-Alake, Egba-Oke-Ona, Egba-Agura, and the Owus. The S. is largely forest, especially from Oba to Igaun, but is well watered and productive. The N.W. is hilly and not well watered. Cotton is grown. The principal means of communication, in addition to the roads, are the Ogun river and the Lagos-Ilorin railway. The capital is Abeokuta. Pop. 63,500.

In 1857 the British government established friendly relations with the Egbas, and in 1892 a treaty of protection was arranged. The country remained an independent native kingdom within Nigeria, with a British resident, until 1914, when it was placed under the direct government of the protectorate of Nigeria.

**Egbert** (d. 839). King of Wessex. The son of Ealhmund, a king of Kent, he was driven into exile to the court of Charlemagne and

returned to England as king of the West Saxons in 802. He then subdued West Wales or Cornwall, defeated the king of Mercia at Ellandune, annexed Kent, and in 829 became overlord of all the English kings. He was defeated by Scandinavian pirates in 836, but in 838 routed a formidable army of Northmen and West Welsh at Hingston Down, Cornwall. The first king of England, he was succeeded by his son Ethelwulf.

**Egede, HANS** (1686-1758). Scandinavian missionary in Greenland. Born in Norway, and educated at Copenhagen university, he was a Lutheran minister at Vaagen, 1706-17. Four years later he went with his wife and family to Greenland, where he worked among the Eskimos for fifteen years and converted many to Christianity. In 1736 he returned to Copenhagen, but continued to superintend the missions in Greenland until his death, Nov. 5, 1758. He wrote accounts of his work, and *A Description of Greenland* (1729-41), Eng. trans. 1745. Consult *The Story of Hans Egede*, Jans Olaf, Eng. ed. 1864.

**Egedes Land.** That portion of E. Greenland lying N.W. of Denmark Strait and N.E. of King Christian IX Land. It is named after Hans Egede.

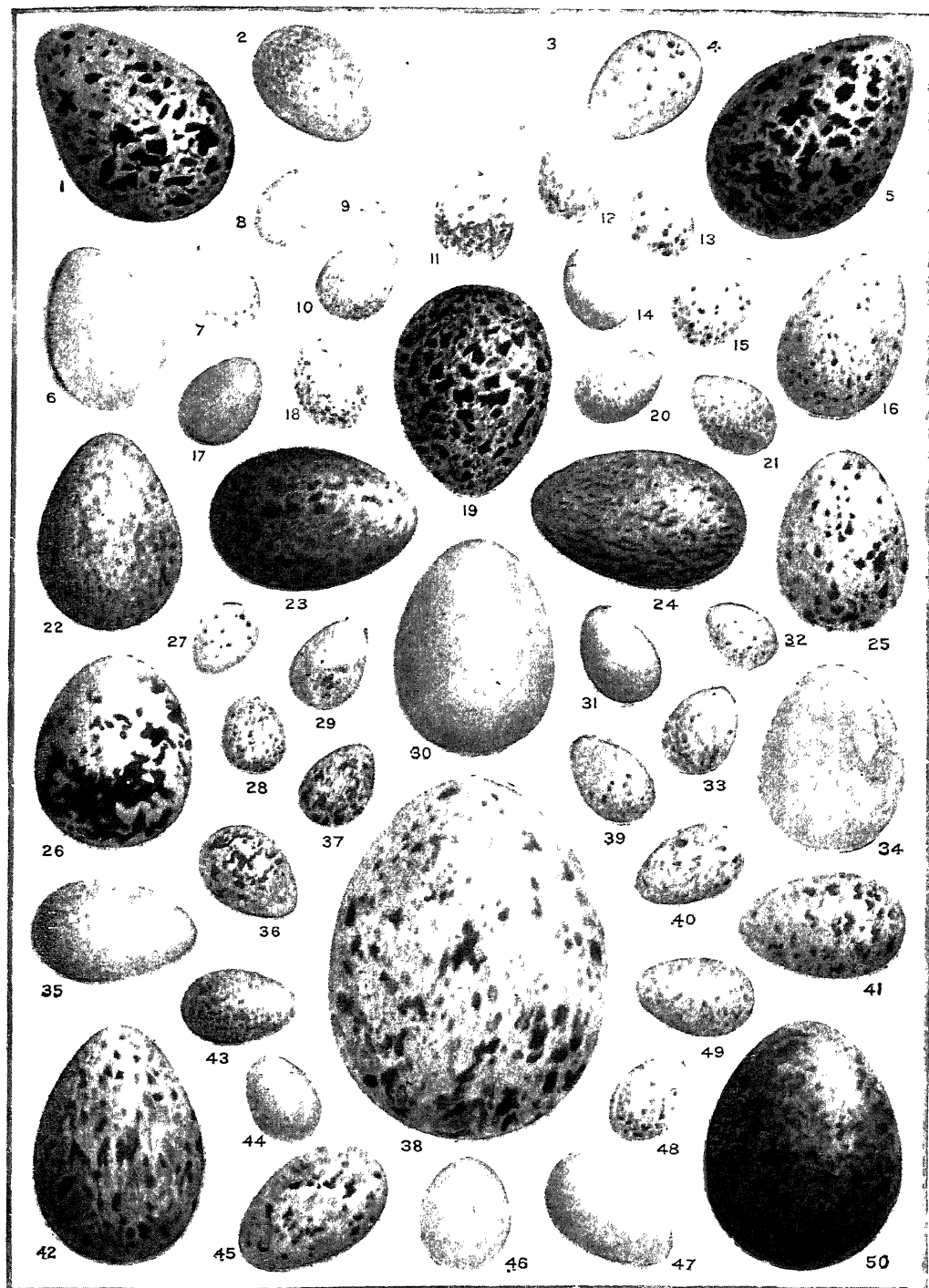
**Eger.** River of Czecho-Slovakia. It rises in the Erzgebirge in Saxony, but most of its course is in Bohemia. It flows generally E. until it falls into the Elbe near Leitmeritz (Litomerice). It drains the S. side of the Erzgebirge. Cheb and Karlovy Vary (Karlsbad) are on it; its length is about 140 m.

**Eger.** German name for the town whose Czech name, used in this work, is Cheb.

**Eger OR ERLAU.** City of Hungary. It stands on the Eger, a trib. of the Tisza, in a beautiful and mountainous region, 70 m. N.E. of Budapest, and is the capital of



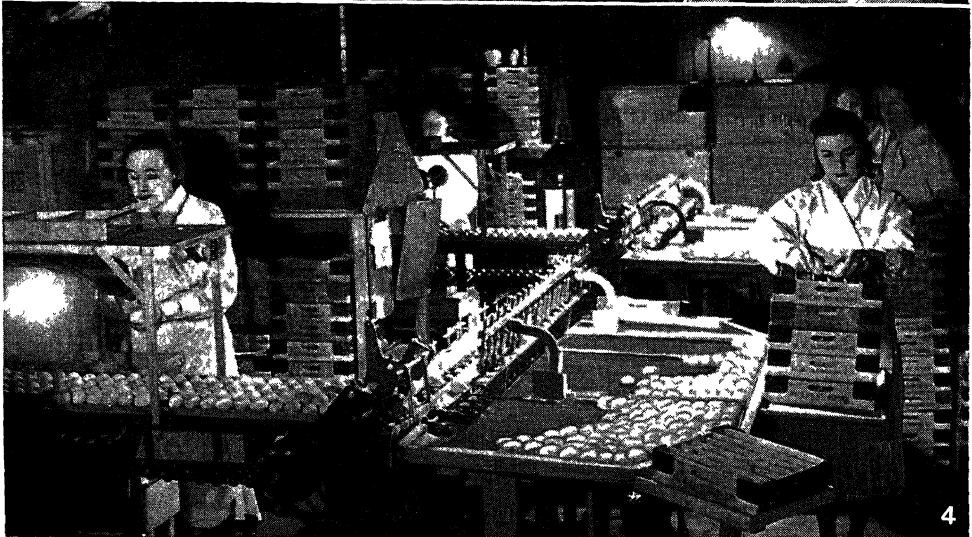
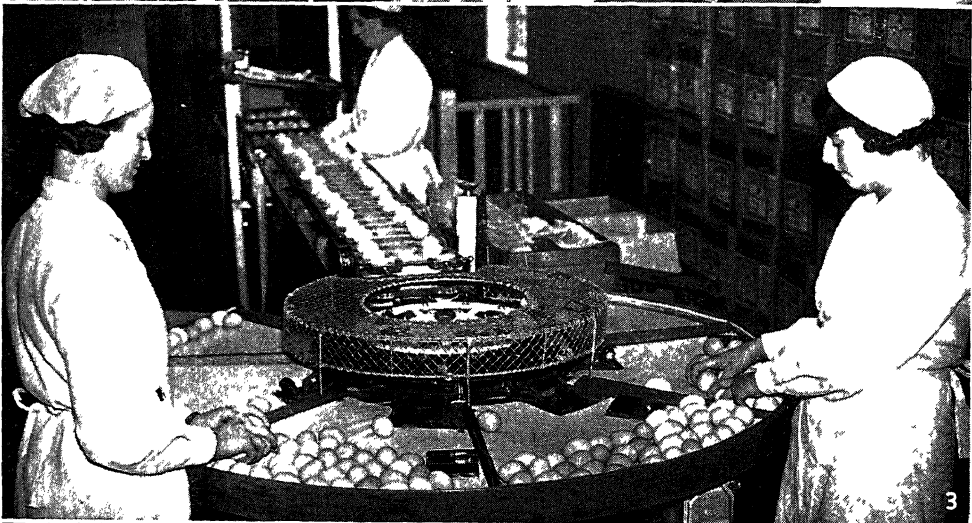
Eger, Hungary. The cathedral of this ancient city, built in the Italian style in the nineteenth century



1. Lapwing. 2. Blackbird. 3. Green woodpecker  
4. Song thrush. 5. Golden plover. 6. Partridge. 7. Gold  
finch. 8. Lesser redpoll. 9. Common wren. 10. Pied  
wagtail. 11. Red-backed shrike. 12. Whitethroat.  
13. Marsh warbler. 14. Whinchat. 15. Swallow  
16. Magpie. 17. Nightingale. 18. Spotted flycatcher.  
19. Red grouse. 20. Robin. 21. Tree pipit. 22. Rook.  
23. Linnet. 24. Cuckoo.

23. Kestrel. 24. Carrion crow. 25. Jackdaw. 26. Sparrow-  
hawk. 27. Chiffchaff. 28. Great tit. 29. Bullfinch.  
30. Pheasant. 31. Hedge-sparrow. 32. Blue tit. 33. Black-  
cap. 34. Barn owl. 35. Jay. 36. Common bunting. 37. Red  
warbler. 38. Golden eagle. 39. Chaffinch. 40. Yellow  
hammer. 41. Mistle thrush. 42. Raven. 43. Skylark.  
44. Stonechat. 45. Nightjar. 46. Kingfisher. 47. Starling.  
48. Peregrine falcon.

#### EGGS OF FIFTY BIRDS THAT FREQUENT THE BRITISH ISLES



1 Grading eggs at the National Laying Test at Milford, Godalming, Surrey, farmers from all parts of the country enter their best laying or breeding hens, and at the end of a two-year period, certificates and prizes are

awarded 2 Testing eggs with electric light at Cheltenham egg grading station. 3 Egg grading machine at work in a West Country grading centre; the machine deals with 300 dozen eggs per hour. 4. Packing eggs.

#### EGG - ASPECTS OF A HIGHLY ORGANIZED BRITISH INDUSTRY

the county of Heves. Its chief industry is the making of red wine, the grapes for which are grown on the hills around. The cathedral, in the Italian style, was erected in the 19th century; the church of the Brothers of Mercy and the minaret of an old mosque are also noteworthy. Other buildings include the palace of the archbishop, the town hall, and the observatory. The town grew up around the bishopric founded about 1010. It was taken by the Turks in 1596, and they kept it until 1687. In the Second Great War the approaches to Eger, the gateway to S. Slovakia, were heavily fortified by the Germans in the summer of 1944; the Russians captured the town Nov. 30. Pop. 30,328.

**Egerdir.** Lake of Asiatic Turkey. Lying between the Sultan Dag and the Taurus Mts., it is 27 m. long and from 3 m. to 10 m. wide. On it stands the town Egerdir.

**Egeria.** In classical legend, a nymph beloved of Numa Pompilius, king of Rome, who set great store by her advice and prophecies. On the death of Numa her grief was so great that she dissolved in tears, and was turned into a fountain by Diana. The name is given in modern times to a lady who stimulates and inspires a man's intellectual activity.

**Egerton, Sir Alfred Charles Glyn** (b. 1886). British chemist. He was educated at Eton and University College, London, became a lecturer and technical consultant at the R.M.A., Woolwich, and was reader in thermodynamics at Oxford from 1921 to 1936, when he was appointed professor of chemical technology at the Imperial College of Science. During the Second Great War he was on the scientific advisory committee to the war cabinet. Made F.R.S. in 1926, he became secretary of the society in 1938. He was knighted in 1943.

**Egerton, Sir Charles Comyn** (1848-1921). British soldier. He was born Nov. 10, 1848. Entering the army in 1867, he took part in Roberts's march to Kandahar, 1880, led the Indian contingent at Suakin, 1896, and commanded the Somaliland operations, being promoted full general in 1906 and field-marshal in 1917. He was a member of the council of India, 1907-17. He died Feb. 20, 1921.

**Egerton Prize.** Award given annually by the Admiralty to the naval officer who, when qualifying for gunnery lieutenant, passes best in the examination in practical

gunnery. The prize was founded in 1901 in memory of Commander F. G. Egerton, R.N., killed in Lady-smith, Nov. 2, 1899.

**Egg.** Reproductive cell formed in the body of the female animal, which, when fertilised by union with the spermatozoon of the male, produces a new individual. Except in the lowest forms of life, when propagation takes place by fission or budding, every animal begins its life history as an egg. In the viviparous animals, as in nearly all mammals, the development of the egg takes place in the body of the mother; in the oviparous it is extruded and development proceeds apart from union with the mother. (See Embryology.)

Only such eggs as are "laid" by the female and hatched externally to her body are here considered. This phenomenon occurs in all the phyla or sub-kingdoms of the animal world except certain of the lowest and most primitive. In the mollusca, which include the snails and the shell-fish, eggs vary considerably in form and size. In the largest of the British snails (*Helix pomatia*) the egg is enclosed in a chalky shell, and is as large as a moderate-sized pea; while one of the snails of Barbados (*Strophocheilus oblongus*) lays a white egg as large as that of a pigeon.

Some insects, like moths and butterflies, lay an enormous number of eggs; but the most prolific creatures of all are the fishes. The ling produces more than 500,000 eggs to each pound of her weight.

Nearly all reptiles lay eggs. Those of the crocodiles and tortoises have hard, limy shells, but most are enclosed in membranous capsules. Those of the amphibians like the frogs and newts, are deposited in gelatinous masses. Speaking generally, eggs laid in the water or in wet places are without hard external coverings.

All birds deposit eggs, varying immensely in size and colour. In size they range from that of the ostrich, which equals about twelve hens' eggs, to the tiny productions of the humming-birds. The colouring of birds' eggs is sometimes of a protective nature, and adapted to the surroundings. The eggs of razor-bills and guillemots, which lay on exposed edges of rocks, are of tapering shape, so that when disturbed by wind or by a passing bird they simply turn round. Among the mammals, eggs are laid only by ornithorhynchus and echidna. (See Biology; Birds, Protection of; Cell.)

\* Paul G. Espinas

**EGG INDUSTRY.** This deals particularly with hens' eggs produced for consumption, either in the original form or processed. In processed form, eggs are used extensively in food manufacture. In their original form, eggs are classified as fresh or store. Fresh eggs pass straight to consumer from poultry farms via the retailer. Store eggs pass from poultry farm via wholesaler to refrigerated store, and thence to retailer; they are imported from the British Dominions, and, in normal times, from Europe and China, and held in cold storage before distribution to retailers.

The increase in the production and consumption of eggs is due principally to refrigeration. With the building of cold stores there came a new incentive to the farmer to produce supplies in excess of immediate demand. Poultry farms became a paying proposition because of the possibility of conserving egg supplies from the surplus productive season (i.e., March to June). Processed eggs are those taken out of shell and processed in quantity. Eggs can be dried by evaporating the water content until flakes or powder be formed. Eggs can also be frozen in quantity out of shells. Dried egg and frozen egg are used in biscuit factories and in cake-making.

#### The Development of the Egg

An egg is of complex structure, a knowledge of which is necessary to ensure the proper handling and conserving of huge quantities. The egg-producing organ of the hen is called the oviduct. The yolk develops first in the ovary; it is enclosed in a sac, develops by the addition of concentric layers of yellow yolk, and, according to an American authority, requires fourteen days for full development. When the yolk is fully developed, the oviduct envelops the yolk sac. The latter splits or opens, and the yolk begins its escape through the oviduct. The male sperms are at the opening of the oviduct, and enter the yolk at the germinal disk, a light-coloured spot on the surface of the yolk. The white or albumen of the egg is laid on the yolk during its passage down the oviduct. Ligaments which suspend the yolk are twisted by the revolving motion of the yolk during its passage. Next are added the shell membranes, the shell pigment, and the outer gelatinous coating, and the egg is ready for expulsion. It takes about three hours for the formation of the first



layers of albumen, three hours for the formation of the shell membranes, and 12-20 hours for the formation of the shell, the function of the uterus and vagina, and the laying. Formation of the yolk is continuous in the sac, and there are always hundreds of minute yolks developing independently, ready for fertilisation.

The yolk varies in colour according to the food or breed of hen. When an egg is opened, the yolk should assume a rounded form and not break easily. It is lighter in weight than the white of the egg, and has a high fat content. Usually the yolk contains the following percentages: 48 water, 30 fat, and 15-20 protein. The albumen, which is a viscous fluid, should be colourless. The shell membranes consist of a network of organic fibres, and are almost transparent. The shell is a calcareous deposit about  $\frac{1}{16}$ -in. thick. It is porous, permitting the easy absorption and evaporation of water and odours. The air cell is the space between the contents of the egg and the shell, caused by evaporation. The egg contracts after it has left the body of the hen, and the space caused by contraction between the two shell membranes fills with air.

#### Causes of Defective Eggs

Eggs are often defective, the physical condition and breed of the hen affecting quality. The size of yolk, percentage of moisture, firmness and percentage of albumen, and strength of shell can often be controlled if the hen receives careful treatment. Summer eggs have weaker albumen than those produced earlier; eggs with weak albumen do not stand cold storage. Dark yolks are due to excessive consumption of green foods by the hen. Grass eggs have dark yolks and greenish whites.

Two-yolk eggs are caused by ovarian conditions; abnormal yolks by the passage of the yolk sac into the oviduct before full development; blood clots by the rupture of blood vessels in the ovary of the hen; meat spots are floating particles in the albumen, either portions of loosened glands torn from the walls of the oviduct, or abnormal growths of tissue.

Shells differ in formation and construction through lack of lime or enforced production in which the shell does not get the requisite time for formation. There are soft shell and thin shell eggs, and shells with excessive porosity.

Shells with slight ridges do not keep well, and should be put aside.

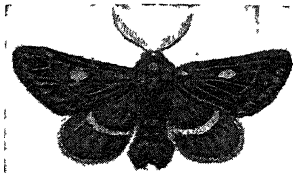
Light float eggs contain an enlarged air cell and a darkened yolk; they deteriorate rapidly. A heavy float egg is a more advanced stage of the conditions of the light float. Blood rings around the germinal disk prove that the egg is unfit for human consumption. An opaque solidified appearance shows that the egg has been subjected to high temperatures; loose frothy appearance, together with a cracked shell, signifies freezing with subsequent thawing. Moisture or sweating of eggs caused by changes of temperature destroys the structure of the albumen. Excessive evaporation is caused by dry air passing rapidly over eggs.

Buying and collecting eggs from poultry farms, arranging for transport and storage, withdrawing from store, and selling to retailers, are in the hands of brokers and merchants working independently or on behalf of provision groups and firms. Early in April the first eggs are shipped to cold stores where they remain for several months. All eggs are usually withdrawn by the end of Jan. Selected eggs are packed in crates with cardboard divisions—fillers and flats—or with "excelsior" packing. Crates are usually 6 ft. long by 2 ft. wide and 6 in. high, each crate containing 130 dozen. The crates, when stowed in the cold chambers, should be stacked flat, with separating dunnage between the crates and floor and walls. The air circulation should be gentle, and a temperature of 32° F. and 80 p.c. humidity are also necessary. Withdrawal from store begins in October, when the supply of fresh eggs diminishes and prices increase. **A.E. Miller**

**Egg, AUGUSTUS LEOPOLD (1816-63).** British artist. Born in London May 2, 1816, he studied under Henry Sass and at the R.A. school, exhibited for the first time in 1838, became an A.R.A. in 1848, and R.A. in 1860. A subject painter, his best works include Queen Elizabeth Discovers She is No Longer Young, 1848; Peter the Great Sees Catherine for the First Time, 1850; and The Night Before Naseby, 1859. He died at Algiers, March 26, 1863. See Dickens illus.

**Egga.** Town of central Nigeria (Northern province). It stands on the right bank of the Niger, a few miles above Baro, the terminus of the Baro-Kano rly. It is the commercial outlet of the Gando country. Pop. about 10,000.

**Eggar Moth** (family *Lasiocampidae*). Name given to certain moths of moderate to large size



Eggar Moth. Example of small eggar moth, *Eriogaster lanestris*

whose caterpillars spin rather egg-like cocoons. Four species are British.

**Eggishorn.** Mountain of the Bernese Oberland, Switzerland, in the canton of Valais. It is the loftiest peak of the ridge separating the Aletsch Glacier from the Rhône Valley. Alt. 9,625 ft. On its S.E. slope is the Jungfrau-Eggishorn Hotel, at an alt. of 7,195 ft.

**Egg Plant** (*Solanum melongena*). Herb of the family Solanaceae. The leaves are oval, lobed, and woolly beneath; the flowers are similar to those of the tomato, white, yellow, or purple. The fruit,

a berry as large as a goose's egg, is white or purple. The fruit is edible, and the herb is largely grown for food. It is also called aubergine, brinjal, Jews' apple, rind apple.

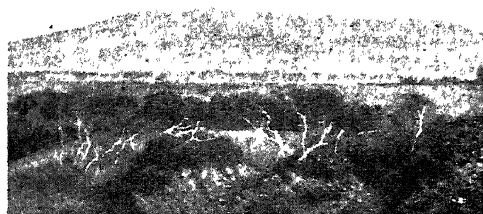
**Egham.** Urban dist. and parish of Surrey, England. It stands on the Thames, 21 m. by railway W.S.W. of London. Near

by are the Royal Holloway College, at Englefield Green, which provides advanced education for 250 women, and Holloway Sanatorium, a large asylum for the mentally deficient, opened in 1885. Pop. 22,650. Between here and Windsor lies Runnymede (*q.v.*).

**Egin** or **EKIM.** Town of Asiatic Turkey, in the vilayet of Erzurum. It stands at an alt. of 3,300 ft. on the right bank of the Kara Su or Western Euphrates, 140 m. S.W. of Trabzon. Founded in the 11th



Egg Plant. Specimen of the herb, showing leaves, flower, and berries



Egmont. The snow-capped cone of an extinct volcano of North Island, New Zealand

century by Armenian settlers from Van, it was the scene of massacres of Armenians in 1895. The houses are built as terraces and the streets are ladders cut into the rock. Fruit, wine, and cotton are produced. Pop. 23,000.

**Eglantine.** Name applied by the earlier poets, notably Chaucer, Spenser, and Shakespeare, to the sweet briar (*Rosa rubiginosa*). In Milton it probably refers to the honeysuckle (*Lonicera periclymenum*), still called eglantine in parts of Yorkshire. See Sweet Briar.

**Eglington.** Village of Ayrshire, Scotland, in the parish of Kilwinning. It is chiefly notable for its castle, a seat of the earl of Eglington and Winton. This is a building dating from 1798 but modelled on the baronial castles with towers and a keep. The village is on a coalfield, and near are large ironworks and coal mines.

**Eglington.** Village of co. Londonderry, N. Ireland. Situated 10 m. E.N.E. of Londonderry, it is on the main Belfast road and has a railway station. During the Second Great War a large aerodrome was built from which air cover was provided for the Atlantic convoys. This was later taken over by the U.S.A.A.F. Pop. of village, 850.

**Eglington Tournament.** Revival of the medieval tournament by the 13th earl of Eglington, Ayrshire, held at Eglington Castle. Aug. 28, 1839. The week's pageant was entirely spoiled by rain. Arrayed in complete suits of armour and representing characters in chivalry, some 15 knights tilted in ancient fashion, breaking their spears in the jousts and finally paying their devoirs to the queen of beauty, Lady Seymour, afterwards duchess of Somerset.

**Egmont.** Cone of an extinct volcano, North Island, New

Zealand. It rises from the Taranaki plain to a height of 8,260 ft. It is perpetually covered with snow, and is a well-known land-mark for sailors.

**Egmont, LAMORAL, COUNT OF** (1522-68). Flemish soldier and politician. Younger son of John IV, Count of Egmont, he was born at Hainault, Nov. 18,

1522. He served in the Algerian expedition of Charles V, and married a sister of the elector palatine. He acted as emissary between Philip of Spain and Mary of England, attending their wedding ceremony. His charge against the French at St. Quentin, 1557, and a brilliant victory at Gravelines, 1558, made him the hero of Flanders, and he was appointed governor of that province by Philip. Egmont protested against the Spanish administration, but refused to join the conspiracy of Flemish nobles in 1566; nevertheless, he incurred the enmity of Alva, regent of the Netherlands, was imprisoned at Ghent, condemned by the notorious Council of Blood, and beheaded, together with Count Horn, in Brussels, June 5, 1568.

The execution of these leaders is usually taken to mark the beginning of the revolt of the Netherlands. In 1865 a monument to Egmont was erected on the site of his death. His closing years are the subject of Goethe's great and popular tragedy (1788). To this work Beethoven wrote incidental music (op. 84) in 1810; the overture continues to be played at orchestral concerts.

**Ego** (Lat. *I*). Term employed generally in psychology to mean either the self or that side of the self which is governed by the instinct of self-preservation. By Freud it is used for that portion of the mind which receives knowledge of the external world through the senses, is capable of reasoning, can be directly modified by experience, and initiates direct voluntary responses to stimuli. The ego is distinguished from the id and the super-ego and in a satisfactorily adjusted person controls the activities of both by means of reason.

**Egoism** (Lat. *ego*, *I*). In philosophy, the theory that only "I" exists, and that everything else is

only an idea of this "I." This is now more commonly called solipsism (*solus*, alone; *ipse*, self). Egoism is more generally understood as the theory of self-interest, which leads a person to act with a view to securing pleasure and advantage for himself without any consideration for others. Egotism, as distinct from egoism, is thinking or telling too much about oneself.

**Egoist, THE.** Novel by George Meredith (*q.v.*), published in 1879. If not great as a story it is yet one of Meredith's greatest prose works. In the central character, Sir Willoughby Paternie, is presented a remorseless delineation of egoism fostered by circumstance.

**Egremont.** Urban dist. and market town of Cumberland, England. It stands on the Ehen, 5 m. S.E. of Whitehaven and close to the Irish Sea. An ancient town, Egremont was a parl. bor. in the reign of Edward I, and has ruins of a 12th century castle. Iron ore is mined and limestone quarried. Market day, Sat. Pop. 6,015. Another Egremont, in Cheshire, is a N.W. suburb of Birkenhead.

**Egremont, EARL OF.** British title borne by the family of Wyndham from 1750 to 1845. It was

first a subsidiary title of the 7th duke of Somerset, Algernon Seymour, for whom it was created in 1749. From him it passed, in 1750, by special arrangement, to his nephew, Sir



After T. Phillips, R.A.

Charles Wyndham (1710-63), who was secretary of state, 1761-63. The 3rd earl, George O'Brien Wyndham (1751-1837), made Petworth, his Sussex residence, noted for hospitality. When he died he left his estates to his natural son, George Wyndham, who was made Baron Leconfield in 1859. The title earl of Egremont passed to a nephew, and became extinct on his death in 1845.

**Egret.** Name applied to several species of small white herons, of which the little egret is one of the best known. It occurs rarely in Great Britain, but is common in S. Europe and many parts of Asia and Africa. See Aigrette.

**Egri Palanka.** Town of Yugoslavia. It is on the high road from Uskub (Skopje) to the Bulgarian frontier, and on the Pcinja. It is both a trade and strategic centre.



# EGYPT: IN ANCIENT AND MODERN TIMES

SIR W. M. FLINDERS PETRIE, F.R.S., MARGARET MURRAY, D.Litt., and KENNETH WILLIAMS

*This article is divided into two main sections. The first describes the wonderful civilization which grew up in Egypt in the earliest days of recorded history, as revealed through archaeology. The second gives a concise account of modern Egypt, especially since the granting of independence in 1920. For later information see Novissima Verba at the end of the Encyclopedia. See also Pyramids; Dendera, Karnak, etc., and articles on the various rulers of Egypt; Alexandria; Cairo; Suez Canal, etc.*

Egypt, owing to its unique climate, the amount of sunshine being more than tropical, is one of the most important lands in the history of man. Its productive power is unrivalled, while the usual N. wind makes it cooler than any other country of that latitude, except ocean coasts. These conditions fitted it for the growth of an early civilization. The advantage of having excellent building stones along the whole valley, with easy water transport, and the necessary lack of agricultural work during the inundation for a third of the year, were the most favourable conditions for a great architecture. The extreme dryness of the country has further led to the wonderful preservation of even the frailest materials. It is thus possible to take a longer continuous view of human changes here than in any other land. The only hindrance is that, the Nile bed and water level of the country having risen about 5 ins. in every century, the early dwellings of man in the plain are now 20 ft. under water.

## Earliest Human Work in Egypt

The Nile Valley began its history as a fault in the Eocene limestone which covers the surface for 400 m. from the sea. This was much raised on the E. side, up towards the Red Sea mts., while on the W. side the surface dips down in the Fayum, and also in the oases, below sea level to more than 100 ft. The fault in the strata naturally received the drainage of the plateau, and so gouged out the Nile Valley. The continuous changes in the history of the country that can be observed begin with the first interglacial period, when there is evidence of a fall of sea level about 300 ft. below the present, compared with 200 ft. in Europe. In the second glacial period a rise of the sea to 650 ft. above the present level compares with 900 ft. in Europe.

The earliest human work here is of the second interglacial age, that of the grand Chellean flint work of Europe, fully equalled in Egypt. This would be placed by some authorities at 250,000 years ago. The sea had retreated in Europe to 600 ft. below the present level, making land continuous from Africa to far W. of Ireland. The

climate was warm and dry, and mankind took a step forward in artistic perception, shown by the imperishable flint remains.

## A Rainless Land

To this succeeded the third glacial period, long ages of cold and high sea level, cutting Europe into scattered islands. The misery of this age is seen by the decay of the only art we can trace—flint working. In Egypt the sea level rose to 800 ft. over the present, compared with 700 ft. in Europe. The Nile Valley and its tributaries were silted up with rolled gravel and sand, and rolled beds of gravel are found at the top of high cliffs. When the sea retreated and the Sahara dried up, there was no more moist wind to form rain, and Egypt became the rainless land we know. Of the later stages of the Stone age in Europe, known by the artistic products of cave man, there are the equivalents in Egypt on the surface. Flints of Mousterian, Aurignacian, and Solutrian types are found in sites on the desert; and the Magdalenian types are those of the prehistoric civilization which can be traced into historic times.

The colouring materials and the patterns are exactly like those of the highland Algerian pottery today; and, as the skulls of the prehistoric Egyptians are almost exactly the same size as those of the prehistoric Algerians, it seems that these early civilized Egyptians were one with the North African people. Stone vases, usually of basalt, were also made, entirely by handwork, without turning. Slate palettes became usual for grinding the malachite which was painted round the eyes as a preservative. The palettes were made in the forms of the elephant, stag, turtle, bird, fish, etc. Ivory combs to fasten the hair were usual, with figures of animals standing upon them. Flint working was highly developed, equal to the best European. The whole civilization seems to have been much on the level of the Maori, or the best Pacific island stage.

**PREHISTORY.** This is divided into five periods, each called after the modern village near which the remains were first

found: (1) Tasian, (2) Badarian, (3) Amratan, (4) Gerzean, (5) Semainian. Of the Tasian little is known, but the Badarian has been well worked out.

The method by which the prehistoric age was reduced to its order of growth can be briefly stated. If there is a full record of all varieties of pottery and other objects found in a thousand or more groups or graves, it will be seen that some forms are obviously derived by degradation from others. A rough classing by such means can be extended by percentage of forms like those already classed; as with the percentage of recent shells in various Tertiary strata. By other modes of sorting and comparison, the groups can be put in their most probable order, keeping all resemblances as close together as possible in the series. Such a series was first worked out only on the Amratan and Gerzean periods, which were divided into numbered stages from 30 to 78, at which point the first dynasty begins the written history. The order of prehistoric time is therefore stated not by years but by sequence dates. Though this method was worked out in the study and not in the field, its accuracy was abundantly proved by excavation.

## Sequence Dates

The sequence dates of the Badarian period run from 20 to 30. This culture merges without a break into the Amratan. The Badarians were already acquainted with the use of metal, for crucibles have been found among their remains. Though Badarian and Amratan pots are alike in being covered with a wash of haematite and then polished, the shapes and decoration are different. The Badarians used open bowls, and their characteristic mode of decoration was by combing the surface of the vessel with an instrument of many prongs. Trade with other countries was already well established; ivory, lapis lazuli, copper, and foreign pottery are found on Badarian sites. Glazing of stone is first known in this period.

The Amratan culture, which began at S.D. 30, introduced entirely different types of pottery, the decoration being by patterns.

By S.D. 36 considerable change begins; new types of pottery rapidly appear, and others die out between 38 and 43. The older stone forms cease at S.D. 40, the newer begin at 39. New materials come in, silver at 38, diorite at 39 haematite at 40. In pottery the characteristic is a class of light brown hard ware, decorated with painting in red lines, and evidently copied from stone forms, in place of basket patterns. By S.D. 40 the culture had suffered a change so complete as to suggest an armed conquest with the annihilation or enslavement of the Amranean population. No such change is found again in the cultural history of Egypt until the Roman conquest. The Gerzean culture was the direct ancestor of the great civilization of the Nile Valley, greatest civilization of the Bronze Age. The links of various kinds are with the E. rather than the W.; the capital may have been Heliopolis, a prehistoric centre of worship.

The climax of this civilization was about S.D. 55. More metal was used; flint flaking reached a perfection not known anywhere before or since; the hardest stones were perfectly cut for vases; gold, amethyst, turquoise, obsidian, and porphyry came into use. Large ships on the pottery indicate the spread of commerce.

In the Semainian period the physical type of the people approximates toward the historic type. Probably for centuries a fresh race had been permeating the country. At last a body about a tenth of the number of the male population entered Egypt as conquerors. They seem to have started in Upper Egypt, and it is probable that they came across the desert road from the Red Sea to Koptos. They were of a higher civilization than the natives, bringing with them the elements of writing, and a great artistic skill, as well as more organization. They held Upper Egypt at first, centring at Hierakonpolis (40 m. S. of Thebes), and later at Abydos (40 m. N. of Thebes). Thence they conquered down to near the Fayum, where they centred about S.D. 77-78. Memphis became the capital in S.D. 79 under Menes and his successors of the 1st dynasty.

At this point we touch the continuous written history of the country. About the close of the Vth dynasty the Egyptians set up an engraved chronicle, known as the Palermo stone, stating the main event of every year, and the height of the Nile, from the beginning of the 1st dynasty. Later

there were papyri containing complete lists of the kings, with the reign of each stated in years and days, with summaries of events. Parts of such a papyrus of the XVth dynasty remain, known as the Turin papyrus. There are monumental lists of kings at Abydos, set up in the XIXth dynasty, but only of the best known periods. Lastly, there are the transcripts of a Greek version of the history compiled by Manetho, which, with many minor corruptions, gives a consecutive record of the whole of the dynasties. All these records agree in their general account, they agree with the total reckoning quoted by Herodotus, they agree with the various external checks—astronomical and others—that can be discovered. This account is therefore accepted here; but many writers prefer to abandon the authorities, and construct fanciful systems of shorter length, bringing down the 1st dynasty from 5500 B.C. of the Egyptian record to about 3000 B.C.; all dates before 1587 B.C. are also reduced.

The 1st dynasty (about 5600-5300 B.C.) was the highest point of the Third civilization. Much of the old arts continued; the hard stone vases, the rich burials, the style of pottery, all show continuity. Yet there was an immense change: writing became usual; a large official class had arisen to administer the country, each office, with its seal, down to the gatherer of lotus seed; jewelry shows skilful work; building both in wood and in brick was much increased; ivory carving was excellent for its natural character and freedom of expression; the use of copper was much extended; and glazing became a decorative art for building. The IIrd dynasty was only a gradual decay, but the IIIrd shows a fresh influence which led up to the greatest age of all.

#### Glories of the IVth Dynasty

The IVth dynasty (about 4800 to 4500 B.C.) established the Fourth civilization. The Egyptians here reached the highest mastery of art, of grandeur, and of conception. Never has the immensity or the accuracy of the great pyramid of Khufu (Cheops) been equalled in later ages; never has there been a greater expression of character and dignity than in the portrait sculpture; never has any people created a greater mass of artistic detail for their tombs, and presumably also for their dwellings now lost to sight. The personal character shown in the portraiture is most attractive; the firmness with kindliness, the dignity unspoiled by

mere pride, the vigour, insight, determination: all this agrees with the ideal character set out in the maxims of that age: "If thou art found good in the time of prosperity, when adversity comes thou wilt be able to endure"; "Let thy heart be overflowing, but let thy mouth be restrained"; "The cautious man succeeds, the accurate man is praised"; "I am one that smooths difficulties; I am one prudent in preventing and easing grief, quieting the mourner with pleasant speech"; "Make not terror among men." During the Vth and VIth dynasties Egypt retained its great civilization, diminished in some respects, with wider diffusion but less care and splendour. By the VIIth dynasty, about 4000 B.C., foreigners were pressing into the country. The old art lingered on in an absurdly degraded form during four centuries.

#### The Coming of the Syrians

The XIIth dynasty (about 3600-3400 B.C.), established the Fifth civilization. By the middle of the XIth dynasty the princes of Thebes began to spread their power, large tombs were again excavated, and monuments carved. The XIIth dynasty reunited all the country, and pushed into Nubia, civilizing and consolidating that region at least as far as the third cataract (lat. 20°). The most magnificent king of this age was Amenemhat III, whose sepulchre was a tank, cut and polished in a block of glass-hard sandstone, 22 ft. long inside, and weighing 100 tons. He reclaimed a large part of the Fayum which had been till then a swamp. The whole character of the age has less originality and freshness than before, more regularity and exact detail, and a more formal treatment of every subject. The Syrians were beginning to press into the country, and in the decadent dynasties, the XIIIth and XIVth, some even rose to be kings. These were the forerunners of the great Hyksos conquest about 2600 B.C.

The XVIIth-XXth dynasties (1587-1102 B.C.) established the Sixth civilization. The XVIIth dynasty was a Nubian family which headed the southern Egyptians against the Hyksos, who were finally expelled from Egypt by Aahmes, the founder of the XVIIIth dynasty. This revival centred specially at Thebes, which became the largest city of the time, and has left a great mass of temples and painted tombs. The most important aspect of this age was the foreign intercourse, by conquest in Syria and by trade with Babylonia, Crete, and Greece.

By about 1530 B.C. Thothmes I had conquered all Syria out to the Euphrates near Aleppo. All this was retained until the wars of Thothmes III, about 1460, and almost as much until the crumbling of the foreign hold under Akhenaton about 1370 B.C. In the XIXth dynasty Sety I recovered Syria entirely, about 1320 B.C.; and Rameses II, though pressed by the Hittites, kept the greater part of that land till about 1250. After that, Egypt barely held a little of the S. of Palestine. On the W. Egypt did not extend any political influence, and the connexion was only by trade, which is mainly seen by objects of Amenhotep III, about 1400 B.C., at Mycenae and other centres, and by great quantities of Greek vases imported into Egypt, especially about 1370 B.C. When Egypt became weakened, there were great coalitions of the Algerian and western peoples against it in 1229 B.C. in the reign of Merneptah, and again in 1197 in that of Rameses III. This was followed by a coalition of Syrians and western peoples in 1194, who were overthrown in a great naval battle.

#### Semitising of Languages and Art

The frequent wars in Syria led to the bringing of great numbers of Syrian men and women into Egypt, and so to the semitising of Egyptian language and art. A greater change took place in 100 years than had arisen in 1,000 years before. The fashion of the time was for a light and piquant style, as seen in Crete; and the sober matter-of-fact Egyptian responded to it, with fatal results to his own character. Graceful and pleasing as many of the tomb scenes are, they have none of the solidity of the old tomb sculptures or paintings on hard rock; a mere coat of plaster or mud over a very rough chamber, all askew and irregular, was sufficient grounding for the perishable colour washes, which would be ruined by a touch of water; the older work was so firm that it could be scrubbed without removing the colour.

The XXIst dynasty (1102-952 B.C.) was an age of poverty and weakness. The land was amicably divided between a succession of priest-kings at Thebes, and the kings at Tanis in the Delta. The main interest at Thebes lies in the desperate attempts to save the mummies of the kings of the XVIIth-XXth dynasties from destruction by robbers. After many had been attacked, and most had been shifted about for safety, the priest-kings at last made one great *cache* at Deir el Bahri, which was left unopened

because it was known that no gold remained with the bodies. Thus it was left until our times, and we can now see most of the celebrated kings of this age face to face in the Cairo Museum.

The XXIInd and XXIIIrd dynasties (952-721 B.C.) revived the power of Egypt somewhat. They were due to the energy of a Mesopotamian adventurer, Sheshenq or Shishak, and his family, who settled at Bubastis. The gold masks and silver coffins of kings and principal officers suggest to what use the loot from the temple of Jerusalem was put. But there was no revival in the life of the country. The Ethiopian invasion about 727 B.C. found Egypt split up among 18 or more little states, but it seems to have put fresh life into the country. The Ethiopian kings who ruled till 664 B.C. were vigorous and able men, and they had a good system of appointing the crown-prince as viceroy of Egypt, so that there was energetic management under experienced control.

The XXVIth-XXXth dynasties (664-342 B.C.), founded the Seventh civilization. They were under Ethiopian influence and then largely controlled by Greek action, and under Persian rule. There was some revival of energy abroad. Necho in 609 raided all Syria to the Euphrates and held it more or less for four years, when the new power of Babylon defeated him, and he retired to Egypt. The Persians held the country from 525 to 401 B.C., and then the native Egyptians in the Delta revived for a couple of generations, forming the XXIXth and XXXth dynasties, 399-342 B.C. Ten years of miserable destruction under the degenerate Persians ushered in the golden age of Alexander's conquest.

#### The Rule of the Ptolemies

The transition from Alexander and his heir to the rule of the old general Ptolemy Soter (the Saviour) was very gradual. Ptolemy, it may be said, ruled from the death of Alexander in 323. The earlier of the family were very able men, wary, strong and enlightened, backed by powerful queens of their own family. Egypt had not been so peaceful and prosperous for some centuries as it was from 300 to 200 B.C. Even under the effete rule of the later Ptolemies, the country was one of the most learned and richest in the world. This dynasty possessed Cyprus and Cyrene for a long time, and parts of Syria and the S. of Asia Minor in the intervals of the perennial squabbles with the Antiochi.

THE ROMAN AGE (30 B.C. to A.D. 640). The end of Egyptian inde-

pendence was the death-stroke to the country. From being one of the richest lands, it became the milch-cow of the emperor of Rome, the private property of the Crown. It was steadily drained of all wealth, taxed in corn to feed Rome, taxed in money, and after three or four centuries even the shabbiest copper coin ceased to be struck, and the people were reduced to barter. Occasional massacres were about the only events that marked the Roman rule.

#### The Arab Rule (A.D. 640-1517)

This was the Eighth Civilization. The Roman government collapsed before a few thousand wild Arab horsemen. Yet such was the vitality of the country, that under the alien but just rule of the Arab, within two centuries the land tax alone produced six or seven million sterling—far the largest revenue of any country of that age. There can be no comparison between the advantages of Roman and of Arab rule. Yet that, like all other power, decayed, and the Mamluk dynasties, for some centuries before the Turkish conquest, were a ceaseless turmoil of fighting and plundering. This unrest was renewed when Turkish power waned, and only the strong hand of Mehmet Ali recovered the advantages of a united government.

THE PEOPLE. Egypt, in spite of its isolated position, has been subject to continued mixtures of race. Starting with an Algerian stock, there have been four or five inflows from the E., two more from the W., a large Greek population in the Delta, and continual mixtures of Southerners from slave labour. Yet the national type of character has remained much the same, and the skull measurements after each mixture return in a few centuries to the older size. Agriculture has always been the main industry of the country, the regular inundation and strong sunshine making it very profitable. Cattle are not kept in large numbers, as all the fertile land is inundated for a third of the year, and there is no permanent pasture. The usual feeding of cattle is by tethering in green crops, or by hand in the summer.

The ancient organization, which may still be seen in the remote country, is for each district to be the property of a great man—anciently an hereditary noble. The police and guards of his district were his personal servants. On his estate he kept workmen for all current purposes; in his great house lived all the artificers that were needed for manufactures; weavers, carpenters, smiths, jewellers, boat builders all belonged to the establishment, and worked as directed. Trade was



mostly in petty market wares, and in raw material not produced on the estate. The government was on the same model. The royal court was only the greatest of the nobles' estates, and the ordinary government was carried on by the officers of the king's household, who only interfered when needful with the local administration of the nobles. It was something like the British control over the native states of India. When a noble wanted great blocks of stone, or anything only produced on the royal estates, he applied, and was granted the present of the material. The tribute sent from different nobles to the court was trifling, merely pin-money for personal use, showing that all cost of government was borne locally by the nobles. The system gave great social stability to the country, everything went on as usual, whether the king was strong or weak. The only purpose of the kingdom was to prevent local fighting and to unify the land for defence.

The official class was probably always corrupt; the management of oases and witnesses under Rameses X reads like modern police work. Where a capable noble can be found, the purely local administration is more likely to be just than where a centralized professional police are in authority.

The army was originally on a small scale, probably the king's people from his estates. By the XIIth dynasty the scribe of recruits is found, and in the great military age of the XIIIth-XXth dynasties the recruiting was severe in Egypt.

#### Native Troops and Auxiliaries

The army was divided into four brigades, named after the great gods of different regions; the army of Amen from the Thebaid, that of Ptah from middle Egypt, that of Ra from the upper Delta, and that of Sutekh from the E. and lower Delta. Besides the native troops, there were many auxiliaries—Libyan and negro archers in early times, Sardinian and other Mediterranean folk later. The Greek accounts of the army forming a regular caste with hereditary lands, was probably a continuation of the Rameside system. The Ptolemies further settled Greek troops, largely in the basin of the Fayum, which they reclaimed by reducing the inflow of the Nile.

The position of women was always high until the Arab conquest. Property was essentially held by women. A man might even have to declare at marriage that all his earnings passed to his wife. Down to Coptic times a wife's

consent was necessary for a valid sale in an open market; even though a mere formula, it proves original intention. The wife always appears side by side with her husband on monuments, and parentage was almost always reckoned one or two generations farther back on the female than on the male side. Apparently the inheritance to the kingdom depended entirely on the female line, and whoever was king in fact had in law to marry the heiress. Polygamy was unusual but not prohibited; in one case of a childless wife the husband took six others. There is no ceremony of marriage preserved, and as in Christian Egypt it was a legal contract, rather than religious, it was doubtless so before then. In the Christian contract there was a divorce clause, stating that either party could cause divorce by proclaiming it in the congregation. The husband's gift was only 12s. and the divorce penalty seven times that sum. In the XXVth dynasty the penalty was only the returning of half the marriage portion.

#### Simplicity of Native Costumes

Dress was simple, befitting the climate. In prehistoric ages the men wore a girdle, the women a short linen petticoat like the Dyaks, or later the Malay *sarong*. The dynastic men wore a waist-cloth or kilt, like that enjoined by Mahomet, from the navel to the knees; the women wore a long, white wrapper, from below the breast to the ankles, held up by shoulder-straps. These remained the dress represented in art till the XIXth dynasty; but in reality, as early as the Vth dynasty women wore tight, high dresses with very tight sleeves, like the modern *galabiyeh*. At the same period, pleated linen drawn into folds was also used. In the late XVIIIth dynasty and onward, very full pleated linen dresses were used for men and women. For the winter, a thick, quilted robe was worn, as shown on an aged king of the Ist dynasty; thick, stiff, long wrappers were usual for viziers and high officers in the XIIth dynasty. In Greek times, thick outer wraps, often with fringes, were usual. Stuff with very long, loose threads all over it, like a shaggy fur, was woven in the XXist dynasty. The weaving of coloured patterns began in the XVIIIth dynasty, but was extremely rare. The common use of colour patterns on clothing is entirely of the Roman period, and most used in the Christian age, as satirised by Jerome.

**EDUCATION.** The Egyptian was always business-like, and kept tallies of all goods, from the Ist dynasty onward. A tally of the XVIIIth dynasty gives the ensign of the Nile boats and the number of blocks of stone which each carried. From these tallies elaborate accounts were drawn up, listing every goat or pigeon on an estate, or putting down as gifts to the gods every item of 106,792 loaves of one kind or 1,975,800 nosegays. Every noble had a staff of scribes on his estates to keep all the bailiff's accounts, and they are very often shown in the tomb sculptures. By far the greater part of the documents that are preserved of all periods are the accounts. This proves that there was a large class of men all through the country who could write, though probably the peasant or petty trader was not as well educated as in Babylonia.

Education was probably in general from father to son, but in the XVIIIth dynasty schools were attended in the towns. A rough and practical geometry was used by the scribes, for the areas of fields and the contents of conical granaries. There was certainly also a much more skilled geometry and astronomy by the pyramid builders, who were capable of setting out a building true to 1 in 10,000 and positions by the stars to 1 in 1,000. In the XVIIIth dynasty the clepsydra or water clock was made as a wide conical vessel, to compensate for the quicker flow of water at greater pressure, and was graduated for each month to compensate for the changes of temperature. In the same age botany was studied, and Thothmes III sculptured a chamber with the foreign plants of his Syrian wars, having separate figures of fruit and seed like a botanical work. The Egyptian always had a keen eye for differences of race, and showed on monuments the types of all the peoples that he visited.

#### Egyptian Literature

The literature begins in the pyramid period with maxims and wonder-tales of magicians, parallel to medieval tales of miracles. In the XIIth dynasty tales of foreign adventure were in fashion, succeeded in the XVIIIth dynasty by tales of character. The growth was therefore much the same as in the last few centuries in Europe. There were also serious works which showed the deeper thoughts of the time. In the XIth dynasty they wrote:

Since the time of the ancestors—  
The gods who were aforetime—  
Who rest in their pyramids . . .  
Their place is no more . . .

None cometh from thence . . .  
 That he may tell how they fare . . .  
 Until we depart  
 To the place whither they have gone.  
 Encourage thy heart to forget it  
 Making it pleasant for thee to follow  
 thy desire  
 Until that day of lamentation cometh  
 unto thee . . .

There is also the song of the man  
 who is weary of the world :

Death is before me to-day,  
 Like the recovery of a sick man,  
 Like going forth into a garden after  
 sickness.  
 Death is before me to-day,  
 Like the odour of myrrh,  
 Like sitting under the sail on a windy  
 day.  
 Death is before me to-day,  
 As a man longs to see his house  
 When he has spent years in captivity.

#### The Gods of the Egyptians

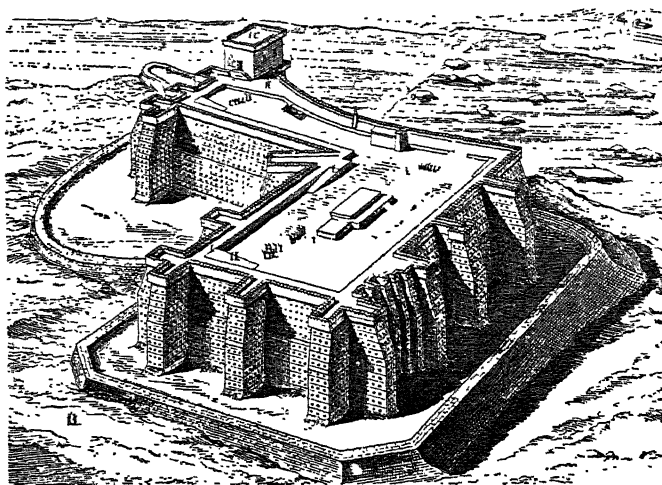
The earliest belief about gods so far as is known, is tribal monotheism, of which traces remain in the early historical writings. Each tribe in the Nile valley seems to have had a separate divinity. As the tribes amalgamated in prehistoric ages, they joined in worshipping two gods, as husband and wife, or father and son, or three gods as a triad. Later, in historic times, when the relationships were already settled, fresh gods were brought in by compounding names, as Ptah-Sokar-Osiris, belonging to three different sources of population. This process was not complete till the XVIIIth dynasty.

Four great classes of gods can be distinguished, the animal gods of the earliest population, the Osiride gods in human form of western origin, the Solar gods of eastern introduction, and the abstract gods, as the Father god, Mother goddess, Creator god, goddess of Truth, etc. All these classes had been mixed in Egypt before the historic times. The belief in passing over a water of death was as old as before the first prehistoric civilization, as the king is said to do so on a float of reeds, whereas boats were usual in the second age. The myths of hunting and killing the gods and feasting on their cooked limbs is older than the Osiris worship, as he is expressly said to have led the Egyptians from cannibalism and violence. From various such indications it is possible to restore several stages in the growth of beliefs long before the date of records that we have. Certainly there was a firmly accepted belief in a ritual for the dead, as from the earliest graves known until historic times the orientation is usually the same, and the funeral offerings do not alter but only increase as time goes on. There must have been an accepted ritual for the position of most of the

offerings, which proves settled and continuous beliefs.

In historic times the principal animal gods were the baboon and the ibis of Hermopolis, lions in some Delta towns, cats at Bubastis, bulls at Memphis, Heliopolis, Kanobos (Canopus), Hermonthis, rams at Mendes and Thebes, crocodiles in the Fayum, hawks at Hierakonpolis and Koptos, serpents at Buto, and several kinds of fish. The principal animal-headed gods were Khnumu the creator and Hershefi, both ram-headed, Bast of Bubastis, Anubis jackal-headed, Thoth ibis-headed, and Horus hawk-headed. The purely human gods were Osiris, Isis, Nebhat, Horus; Amen, Mut and Khonsu

open along the front. The next stage is to have a store chamber at the back, then a way to the roof: after that more chambers and then a roof chamber forming an upper storey. This was no doubt the growth of the superior house also, and as the temple was the house of the god, it is the plan of the temple. In the latest of the temples the old verandah remains as the vestibule hall open in front, the courtyard is the temple court, the store chambers come behind the hall. The peristyle court is an expansion of the verandah around the front court. The hypostyle hall, farther in, is the usual inner hall of the dwelling house. It has also been proved that the course



Egypt. Bird's-eye view of the ancient fortress of Semneh, as restored by Charles Chipiez

From *A History of Art in Ancient Egypt*, G. Perrott and C. Chipiez, by courtesy of Chapman & Hall, Ltd.

the triad of Thebes, and Neit of the Delta. The cosmic gods are Ra the sun, also called Aten, Anher the sky, Sopdu the zodiacal light, Nut heaven, Geb earth, Shu space, Hapi the Nile. The abstract gods were Ptah the Creator, Min the Father, Hathor the Mother, Maat Truth, Sefekh of writing, Nefertum of vegetation.

One great break in the religion must be mentioned, the entire dominance of a scientific worship of the radiant energy of the sun, called the Aten or "lord," to the exclusion of all other gods. This hardly survived the life of its founder, Akhenaton (1383-1365 B.C.).

#### Art and Architecture

The simplest beginnings of architecture are seen in the models of the peasants' huts that were placed on the graves for the spirits. The essential is a verandah with an enclosed court before it, perhaps developed from the Bedawi tent.

of daily worship of the priest was directly copied from the domestic service to a noble.

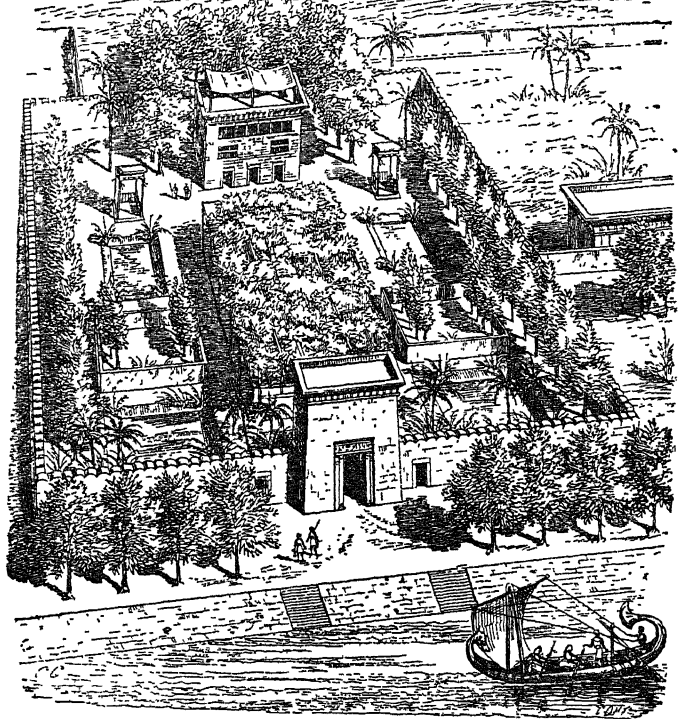
Generally temples grew through additions by different kings, as in London the building of Westminster Abbey extended over four or five centuries. Beside the house temple, just noticed, there were shrine temples, copied from the hut shelters put over the sacred ark of a god; these were open front and back, so that a procession could pass through them.

The earliest known temple is part of the great complex of buildings of the IIIrd dynasty surrounding the Step-pyramid at Sakkarah; its reeded and fluted pillars are of white limestone. Next in date is the temple of Khafra of the IVth dynasty at Gizeh; this has plain square monolithic pillars of red granite, 16-20 ft. high. When soft sandstone was

used in the XVIIIth dynasty, and later, the larger temples became choked by the bulky columns required, as at the Great Hall of Karnak. The decoration of the temple with scenes of offering was not for ornament, but in order that the representation should magically be equivalent to the perpetual performance of the successive acts of divine worship. The sculpture in the temples followed the general course of the art.

The complete temples remaining are, of the IVth dynasty, the granite temple at Gizeh; of the XVIIIth, of Hatshepsut at Deir el Bahri, Thothmes III at Medinet Habu, Thothmes I to Ptolemies at Karnak, Amenhotep III at Luxor and El Kab; of the XIXth, of Sety I at Abydos, Qurneh, and Redesieh, of Rameses II at Ramesseum, Abu Simbel, and various Nubian, of Rameses III at Medinet Habu, Ptolemaic at Edfu and Dendera, Roman at Esneh. Three series of royal tombs are known—the underground brick and timber chambers of the Ist and IInd dynasty at Abydos, the pyramids of the IIIrd—XIIth dynasty at Gizeh and, scattered for 40 m. S., the rock-cut chambers of the XVIIIth—XXth dynasty in the tombs of the kings at Thebes.

Remarkable excavations, confined chiefly to the Valley of the Kings in the Thebes district, were conducted by the 5th Lord Carnarvon (*q.v.*) and Howard Carter (*q.v.*). The latter on Nov. 5, 1922, in almost the last unexplored pieces of ground, made the sensational discovery of the tomb of King



Egypt. Ancient riverside villa, as restored by Charles Chipiez

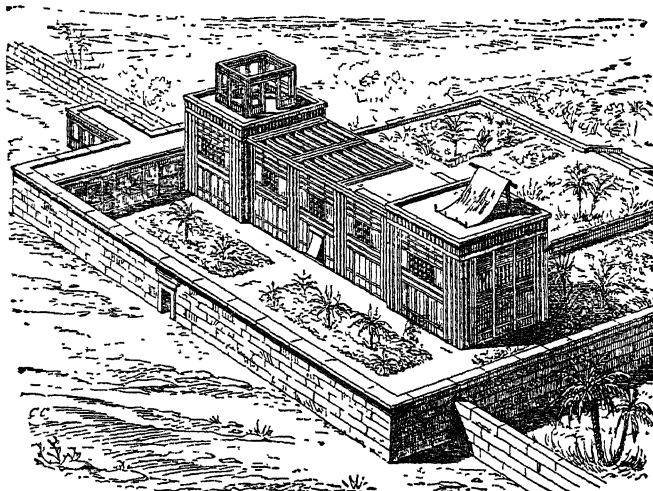
*By courtesy of Chapman & Hall, Ltd*

Tutankhamen (*q.v.*), and he superintended the removal of the treasures found therein.

The mummies of the kings from these Theban tombs have been preserved. Great cemeteries of private tombs with sculpture and painting are at Gizeh and Sakkarah for the pyramid age, at

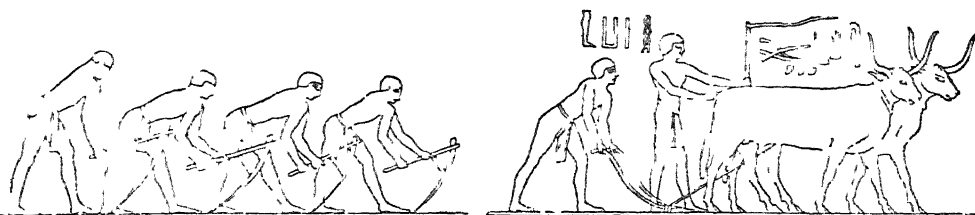
Beni-Hasan for the XIIth dynasty, and at Thebes for the XVIIIth—XXth dynasties. Forts of massive brick enclosures, with panelled pattern outside, are of the IInd dynasty at Abydos, and of the XIIth dynasty in Nubia. Temples were often fortified with immense walls, as that 80 ft. thick at Tanis. The only complete plan of a town is of the XIIth dynasty; it has many large mansions of 60 rooms and rows of streets of workmen's houses, all laid out in a regular plan. The houses and the earlier temples were built of mud brick, which was covered with lime-wash or stucco, on which fresco painting was placed in the better houses; the early brick temples were sometimes lined with glazed tiling of large size.

Statuary is known from the Ist dynasty onward. It begins in limestone and ivory, with an entirely naturalistic style, full of character and life, and superior to later work in its truth and absence of convention. A copper statue is recorded in the IInd dynasty, and a large copper statue has been found of the VIth dynasty. Diorite and other hard rocks were also sculptured. In the XIIth dynasty the style was more finished and delicate, but less living. The XVIIIth dynasty had more vivacity, but



Egypt. Reconstruction of a wooden building, made from imitations of assembled wooden construction found in tombs

*By courtesy of Chapman & Hall, Ltd.*



Egypt. Agriculture as depicted on ancient monuments. Left, four men hoeing, from Beni-Hasan; right, a ploughing scene, from the necropolis at Memphis

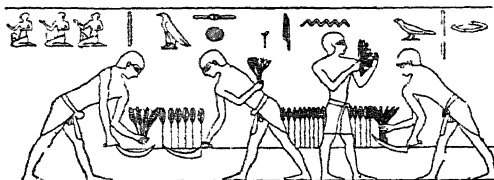
By courtesy of Chapman & Hall, Ltd.

generally less able work; hard rocks were mostly used, and many colossal statues were carved, ranging to 900 and even 1,200 tons weight. Though work declined in the XIXth dynasty and onward, there was a revival in the XXVth and a modification by Greek influence after that; but there is no sculpture of merit after Alexander.

Metal work—mostly in copper—was skilfully wrought. Large vessels were made by hammer work, often figured in the tomb sculptures; a narrow-necked flask of copper is only 1-40th in. thick. The casting, a thin form of copper in place of a wax model, was carried on from the IIInd dynasty; for figures a core was made of ash and clay, a thin coat of wax was put over it and finely tooled, an outer mould was placed around that, the wax melted out, and copper or bronze run in. The metal is often not more than 1-50th in. thick. A ring handle playing loose in its ring attachment were cast all in one. Spinning thin metal bowls in a lathe was perfectly done in the XIXth dynasty.

Jewelry was delicately made as early as the prehistoric, when minute beads of gold, and thin gold worked over a core of limestone, are found. In the ISt dynasty gold was perfectly soldered, and in the XIIth dynasty there was the most delicate work of soldering cloisons of gold on an open-work basis, and inlaying with hundreds of minutely cut pieces of coloured stones—turquoise, lazuli, and cornelian. No later jewelry

exceeded this in beauty and delicacy, though the same style was maintained till Greek times. Granulated work was finely made in the XIIth dynasty; minute globules of gold in close rows were soldered on curved surfaces in regular patterns with perfect precision. In the XVIIIth dynasty there was less delicacy, and the favourite process was the inlaying of one metal in another to form figures and scenes.



Egypt. Harvest scene, as shown on a tomb at Gizeh

In the XXVth-XXXth dynasties this inlaying of gold thread in bronze was carried out so as to clothe statues completely with designs copied from embroidery.

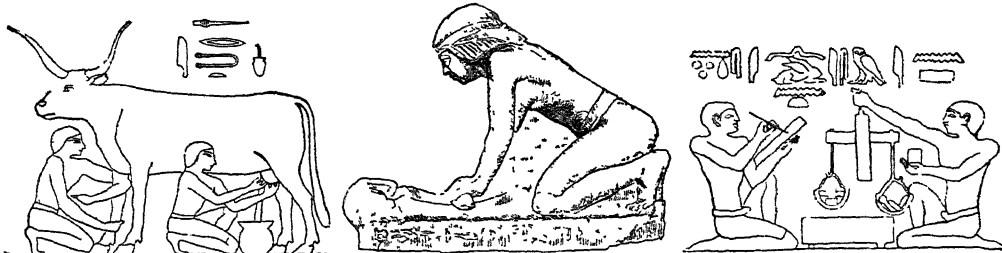
Glazing was known from the beginning of the prehistoric civilization, and used to cover both faience and stone. Vases with two-colour glazing were made in the ISt dynasty, and tiles of many colours in the IIIrd dynasty. The great development of glazing in many colours was in the XVIIIth, for tiles, inlay of walls, vases, dress ornaments, and cheap jewelry. Innumerable statuettes were made of glazed ware, often with minute detail of features, especially in the XXVIth dynasty. Glass was brought in rarely in the second pre-

historic age, ISt and XIIth dynasties, from some unknown source. The great output of it in Egypt was after the Syrian craftsmen were brought in during the XVIIIth dynasty. Then there was an immense output of coloured glass vases, beads, and other work. This was revived in the Ptolemaic and Roman times as minute inlay or mosaic work of the greatest delicacy. Blown glass vessels were

not known till late in the Greek or Roman period. Alexandria was the main home of fine glass work in classical times, until superseded by Venice after the Arab invasion. Painted glass lamps were the form of this craft which was maintained by the Arabs. The fine work of furniture, gilding, stucco, weaving, and other kinds cannot be well described here; but the Egyptian was for thousands of years the supreme craftsman of the world.

W. M. Flinders Petrie

*Bibliography.* The Manners and Customs of the Ancient Egyptians, J. G. Wilkinson, rev. ed. S. Birch, 1878; History of Egypt, W. M. F. Petrie, 1894, etc.; Ancient Records of Egypt, Eng. trans. J. H. Breasted, 5 vols., 1906-07; The Arts and Crafts of Ancient Egypt, W. M. F. Petrie, 1909; The Dawn of Civilization: Egypt and Chaldaea, G. Maspero, 5th ed. repr. 1910; Egypt and Israel, W. M. F. Petrie, 1911; Development of Religion



Egypt. Everyday scenes depicted in inscriptions. 1. Milking, from a tomb at Sakkarah. 2. Corn-grinding, figure from Boulak. 3. Scribe registering the weighing of merchandise from Sakkarah

By courtesy of Chapman & Hall, Ltd

and Thought in Ancient Egypt, J. H. Breasted, 1912; Manual of Egyptian Archaeology, G. Maspero 6th Eng. ed. A. S. Johns, 1914; Kings and Queens of Ancient Egypt, W. Brunton, 1928; Egyptian Temples, Margaret Murray, 1933; Everyday Life in Ancient Egypt, A. W. Shorter, 1933, Short History of Ancient Egypt, A. Weigall, 1934; Ancient Egyptian Materials and Industry, A. Lucas, 2nd ed. 1934.

**MODERN EGYPT.** The main physical features of Egypt are the Nile and the desert. Egypt is bounded N. by the Mediterranean, N.E. by Palestine, E. by the Red Sea, S. by the Anglo-Egyptian Sudan, and W. by Tripoli and the Libyan desert. The area of the country is roughly 383,000 sq. m., but only 13,600 sq. m. is habitable. A division is made between Lower, Middle, and Upper Egypt. Lower Egypt is the northern part—the delta of the Nile; Middle Egypt is the land between Cairo and Assuan; and Upper Egypt is the southern part—the middle Nile valley. The fertile portions of the country are mostly around the delta, the Nile valley, and the oases. With the continual improvement in drainage and irrigation the cultivable area is yearly increasing.

A census in 1947 gave the pop. as 19,087,304, with a density of 1,398 per sq. m. The majority are fellahen (peasants), and depend upon the resources of the Nile. Egypt's river has conquered the desert and by its annual overflowing has deposited much sediment, which it carries from the Abyssinian mountains through the Atbara and Blue Nile, converting sandy land into cultivable areas. In Upper Egypt the Nile valley is narrower and the desert on either side is bounded by hills. The valley lands in this region are well cultivated.

The Nile enters Egypt proper at Wadi Halfa, just N. of the second cataract, flowing through a narrow valley as far as 25° N.

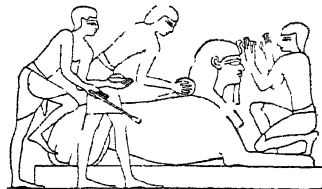
The delta extends some 100 m. S. to N., and 155 m. on the shore

of the Mediterranean between Alexandria on the W. and Port Said on the E. The surrounding land, S., is watered by a network of canals and the two branches of the Nile, Damietta and Rosetta. The lakes of the Delta, Maryut, Edku, Burlus, and Menzala, are all shallow, the water being salt or brackish. Lake Menzala (780 sq. m.) is the largest.

The desert plateaux extend on either side of the Nile valley from the S. borders of Egypt to the delta in the N. The E. area, the Arabian desert, between the Nile and the Red Sea, varies between 90 m. and 350 m. in width. To the W. the Sahara extends unbroken for many hundreds of miles. The great oases, Siwa, Baharia, Farafra, Dakhla and Kharga, in the western desert, receive water from a sandstone bed about 400 ft. below the surface.

The flora of Egypt is scanty, the country being barren of woods or

are the hyena and gazelle, while the hare, fox, and jackal are often found in the desert, and the lynx, ibex, and bats in the desert in the Nile valley. Reptiles include the horned viper, the echis, and the hooded snake. Lizards are numerous; so are spiders, beetles, fleas, mosquitoes, and scorpions; locusts are not so common. Fish are



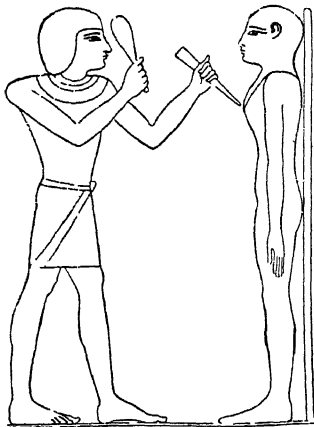
Egypt. Artists at work on a statue, from an inscription at Thebes

plentiful. Over 300 species of birds are found.

Egypt is virtually a rainless country; the annual rainfall in Alexandria and on the Mediterranean coast does not exceed 8 ins. Southwards rain is very irregular. The mean temperature at Port Said and Alexandria varies between 57° F. in January and 81° F. in July. At Cairo it is 53° F. in January, and 84° F. in July. The temperature is high by day and falls quickly at night. There is a prevailing north wind utilised by craft sailing up the Nile. The Khamsin, which fills the air with sand from the Sahara, raises the temperature to as much as 115° F.

The chief towns are Cairo, the capital; Alexandria, the chief seaport; and Port Said. The coastline is over 600 m. on the Mediterranean, and about 1,200 m. on the Red Sea. Part of it is rocky, but nowhere do the cliffs exceed a height of 1,000 ft.

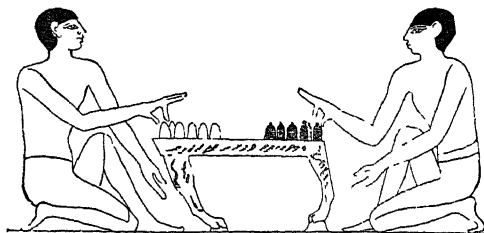
**PEOPLE AND LANGUAGE.** The population has shown a large increase since the beginning of the Turkish occupation, when an estimate gave it as less than 2,500,000. About 91 p.c. are Muslims, 7 p.c. Copts. There are Turkish, Albanian, Kurdish, and Georgian elements in the upper classes, but dwindling. The most interesting type is the fellah; the most picturesque, the Beduin. The fellah has been often described as the backbone of the country. Tall, thin, and wiry, he reveals by his sad and weary aspect the tale of the last centuries. To the nomad Arab fellah is a term of contempt. The fellah leads a life of extreme simplicity; a *galabieh*, or blue cotton frock, and a turban comprise his wardrobe; his fare consists of millet bread and raw vegetables.



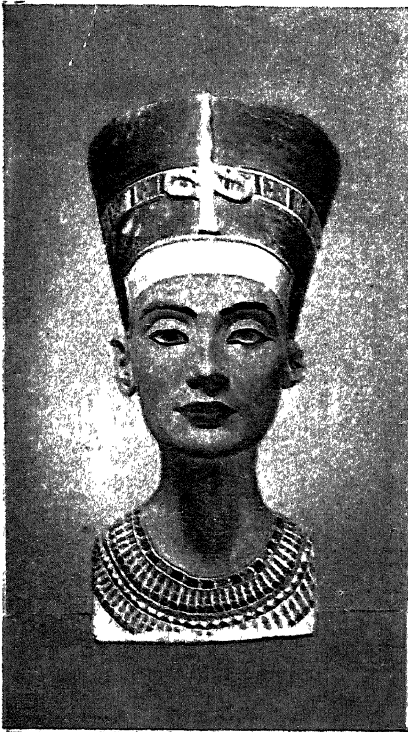
Egypt. Sculptor at work, from an inscription at Thebes

forests. The growth of most importance is the date palm, of which there are some 30 varieties all over the country. Other trees are the orange, clove, lemon, mulberry, and pomegranate. Sycamore, tamarisk, and milk trees are in evidence. Grapes are found in the Farafra. Egypt also grows limes, bananas, melons, prickly pears or Indian figs, and olives.

Of animals, the camel, ass, sheep, and buffalo are most used. The horse is not so much in evidence. Among the wild animals of Egypt



Egypt. Ancient representation of a table game, from an inscription at Beni-Hasan



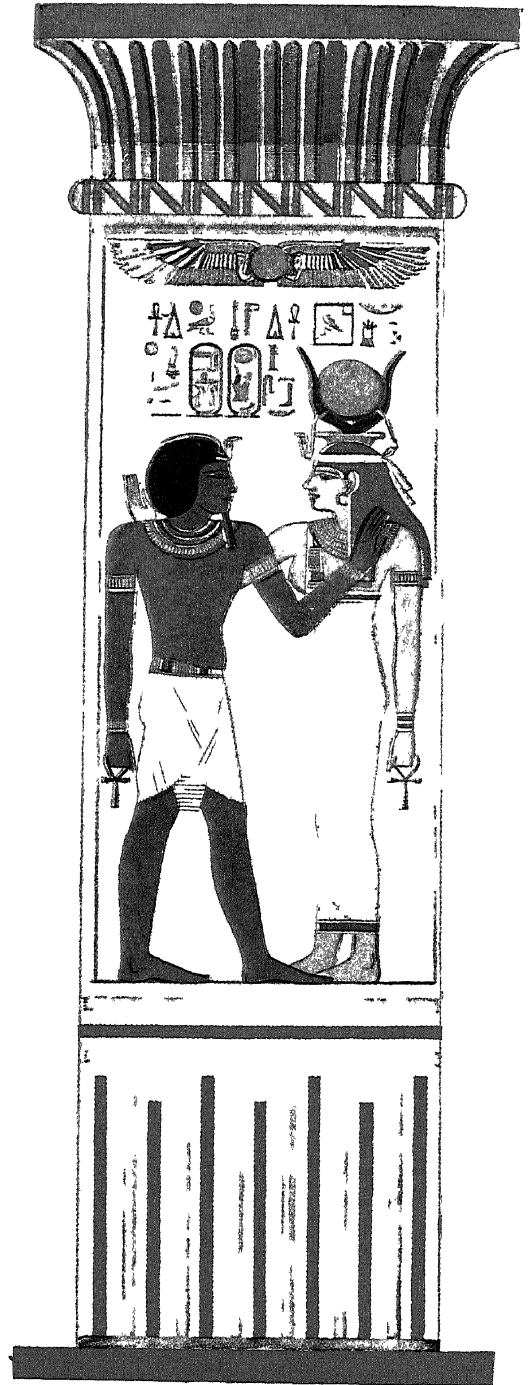
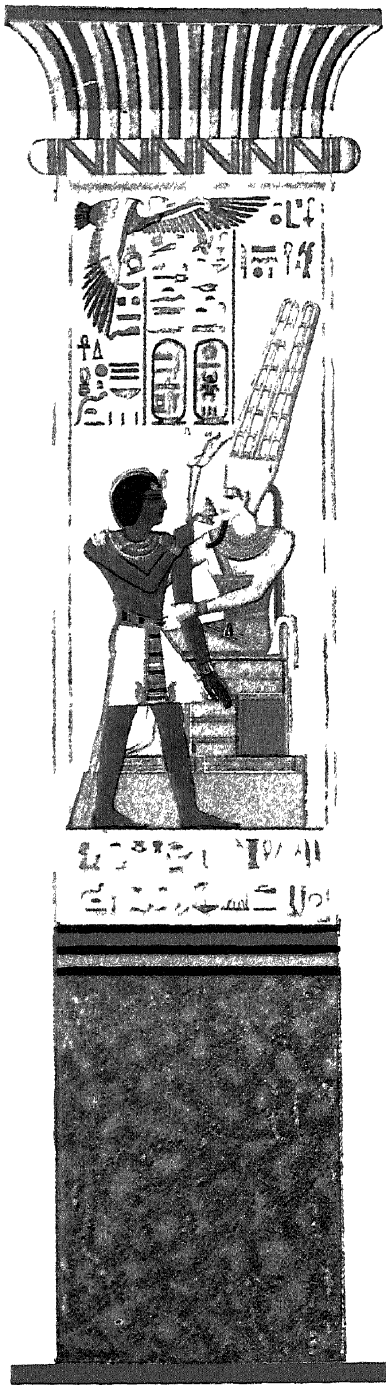
On the left are side and front views of the famous painted limestone head of Nefertiti, wife to the heretic pharaoh Amenhotep IV (ruled 1375-1358 B.C.). This was discovered in the workshop of the sculptor

Thothmes at Akhetaton and later found a home in the Berlin Museum. Right the gorgeous anthropoid casket containing the mummy of Tutankhamun (died 1353 B.C.), who was the son-in-law of Amenhotep

#### EGYPTIAN ART: PERFECTION IN SCULPTURE AND SPLENDOUR IN DESIGN

To face page 2964





Piers with capitals belonging to the XVIIIth dynasty 1700-1600 B.C. The left pier 17 ft 6 ins high shows Amen on a throne receiving an offering of lotus flowers from Amenhotep II whose names and titles are inscribed above. On the right pier 13 ft 1 1/2 ins high,

is seen Amenhotep III and the goddess Hathor (Isis) who bears on her head the solar disk resting between two horns and the Uraeus or serpent emblem. Both figures carry the *ankh* or key of life. Above are the names and titles of both the goddess and the king.

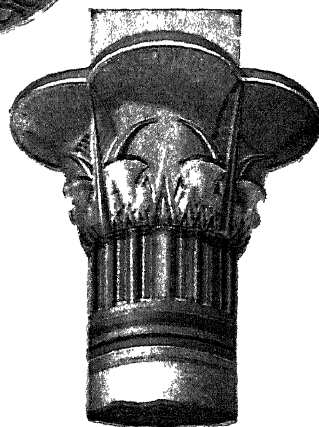
**EGYPTIAN ART DECORATED PILLARS OF NEARLY 4,000 YEARS AGO**



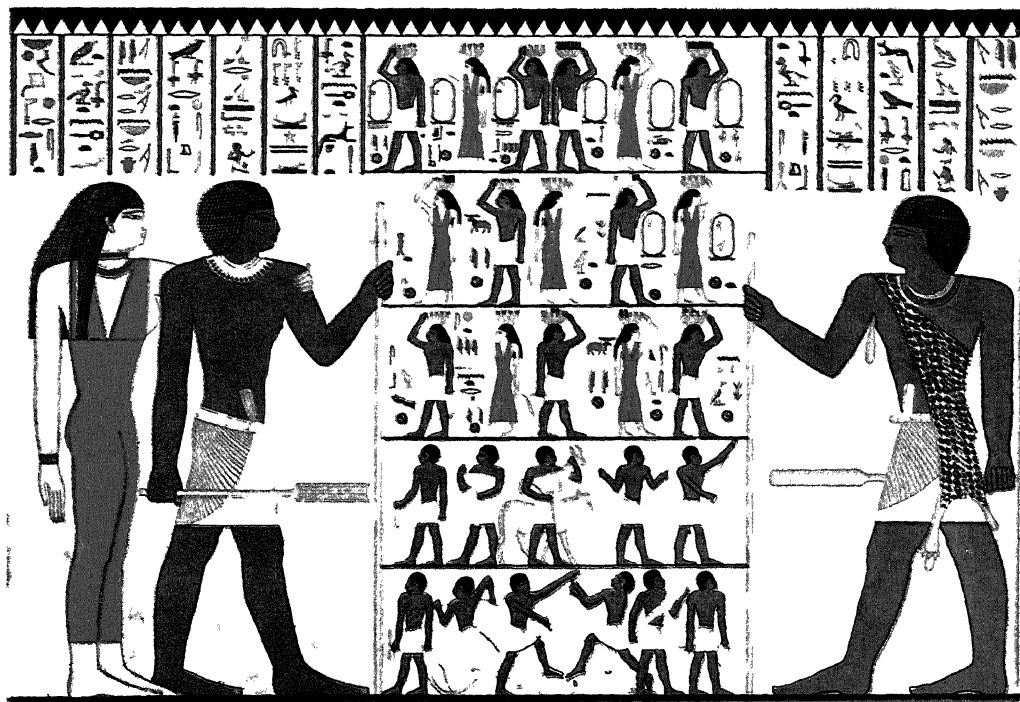
Palmiform capital of the Ptolemaic period from the great temple of Isis at Philae



Bell shaped capital from the Hypostyle Hall at Karnak diameter at widest 22 ft

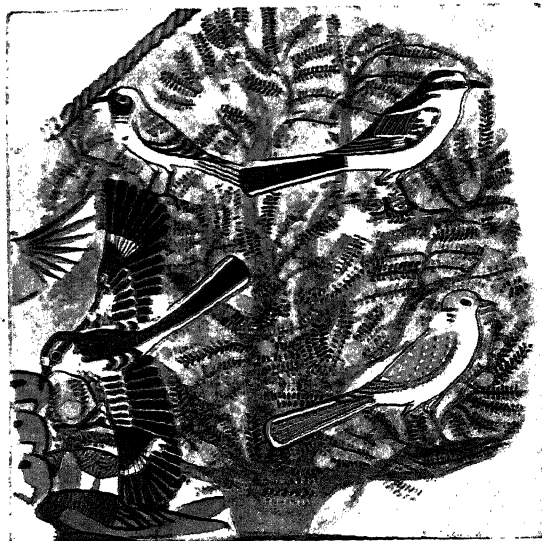


Caulicole capital from Philae in style which suggested the Corinthian capital to the Greeks

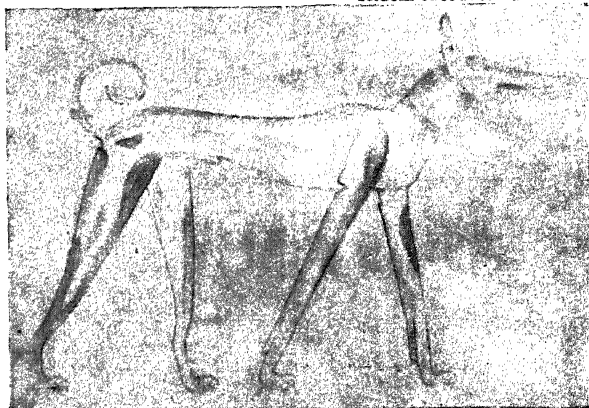


Inscription from the tomb of Merab at Gizeh Between the two figures of Merab who on the left is accompanied by his mother are seen subjects carrying baskets of wine food etc The two bottom rows show the chief butcher followed by his assistants bearing a goose and a calf and cutting up an ox

EGYPTIAN ART RICH ORNAMENT AND COLOURED INSCRIPTIONS OF AN ANCIENT CIVILIZATION



From the tomb of Khnumhotep: left, a redstart, two shrikes and a dove in a flowering acacia, with ducks below. Right, an ibis on a papyrus plant. The ibis, held to be sacred, was once common in Egypt though now seldom encountered north of the Sudan



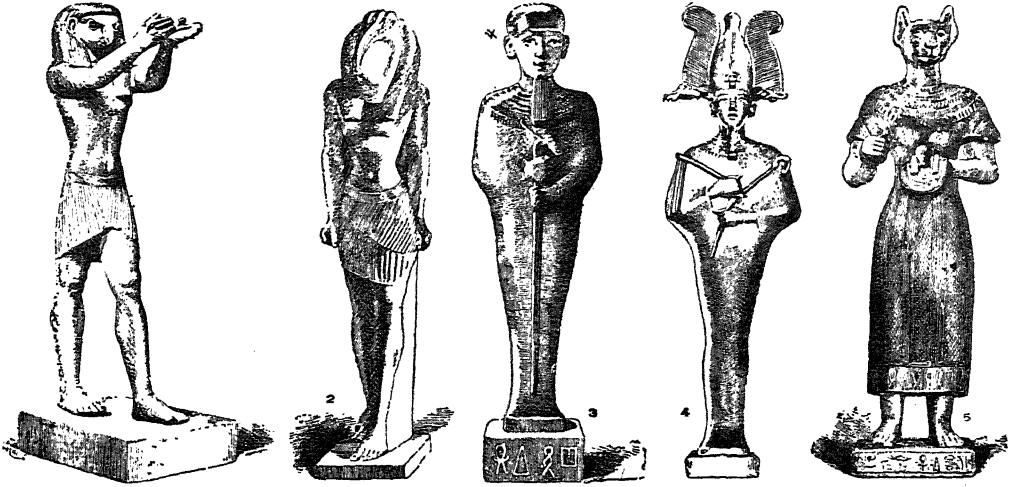
The dog on the left, of greyhound type, is probably the ancestor of the modern Nubian "slughi" hound; the bird, right, is a species of heron. The first is in the tomb of Amenemhet, while the second forms part of the great harpooning scene in the tomb of Khnumhotep



It is in the Middle Kingdom tombs at Beni Hasan, belonging to powerful local barons, that Egyptian wall painting reaches its highest development: the truth and vitality of the group of animals in this page speak for themselves. Immediately above is a cat (probably domestic) that has climbed a papyrus stem, from the tomb of Khnumhotep; while to the right is a grey-and-tan hound from the tomb of Khety

#### EGYPTIAN ART: REPRESENTATIONS OF ANIMALS FROM ANCIENT FRESCOES

*From drawings by Howard Carter in Newberry, 'Beni Hasan,' Egypt Exploration Society*



Egypt. Ancient divinities represented in Egyptian sculpture. 1. Horus, hawk-headed god of day. 2. Thoth, god of wisdom. 3. Ptah, the creator, chief god of Memphis. 4. Osiris, god of the underworld. 5. Bast, goddess of Bubastis

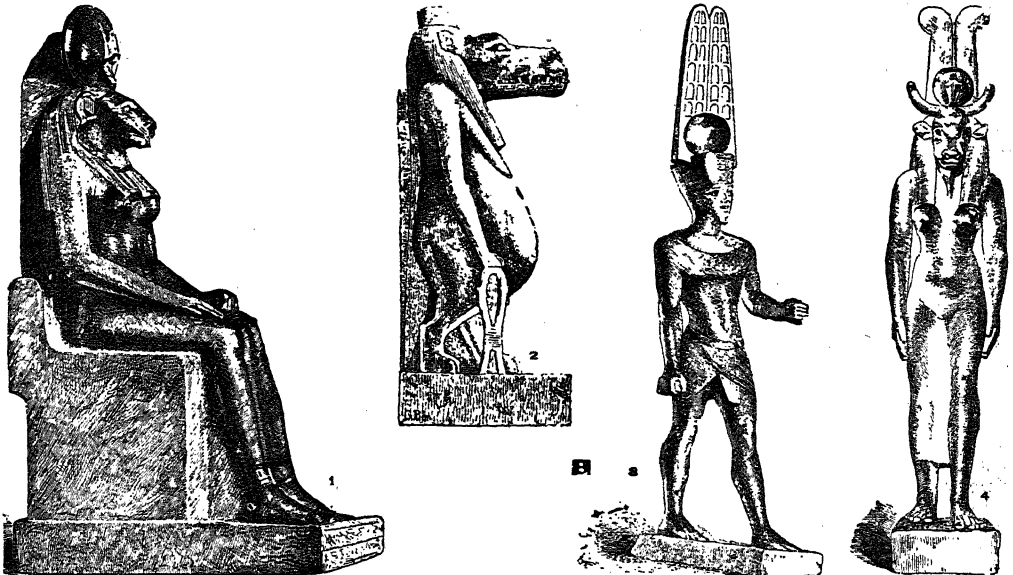
By courtesy of Chapman & Hall, Ltd.

The Beduin presents a brighter picture. These "people of the tent" are shepherds and herdsmen of sturdy but somewhat undersized stature, with coarse, thick, black hair, and well-chiselled features. The Nubians, or Berberins, dwell in Upper Egypt, and are of mixed negro and Arab blood. The majority are peasants. The Copt is the native Christian of Egypt, and is usually of a studious or commercial type. According to the latest census the Coptic Orthodox Church numbers over 1,250,000 followers.

The women of Egypt have been described as models of beauty in body and limbs between the ages of fourteen and twenty, but few retain either good looks or fine physique beyond the age of forty. Many women of the upper classes are rapidly becoming Europeanised in both dress and habits. The maidens of Egypt marry at an early age, generally between ten and sixteen. Divorce is of a facile order. If the husband repeats the words "Thou art divorced" three times the divorce is a *fait accompli*. Arabic is the universal language

of Egypt. Turkish is rarely spoken, and until recently French was used by the better educated Egyptians. The English language, however, is coming into greater use. The literary record is scattered, since Arabic is also the language employed by other Eastern countries. After the fall of Bagdad, Cairo sprang into prominence as the chief literary centre of the Islamic world, and to the present day it retains this distinction through its university of Al Azhar.

**HISTORY.** The Turkish conquest of Egypt in 1517 effected



Egypt. Ancient deities. 1. Sekhet, goddess of war. 2. Tonaris, or Opet, goddess of childbirth. 3. Amen, or Ammon, the sun god worshipped at Thebes. 4. Hathor, goddess of love, mirth, and social joy

By courtesy of Chapman & Hall, Ltd.

little change in the administration of the country. The apathy of its Turkish rulers led to a long period of unrest, which culminated in 1609 in a mutiny among the Turkish army of occupation. The rebellion, however, was curbed in Feb., 1610, by the governor, Mahomed Pasha. Risings among the Egyptians and the Turkish soldiers, plagues, pestilence, and famine mark subsequent years. Disease in the spring of 1619 carried off 635,000 persons, and similar ravages in 1643 completely wiped out 230 villages.

This rather doleful and somewhat obscure period of Egyptian history offered little opportunity for a great man, although in the next century Ali Bey appears to have succeeded in introducing a measure of order and reform. By stern methods he suppressed the notorious outlawry of the Beduin in Lower Egypt. In 1768 Ali declared the independence of Egypt, and was afterwards given the title of sultan. Turkey, however, defeated Ali in 1773, and much the same dismal state of things that existed during the previous Turkish occupation was re-established. A new epoch, however, opened with the short-lived conquest of Egypt by Napoleon. Insurrection broke out and after war with Turkey, in which the British intervened by landing a force in 1801. Napoleon evacuated the country. Turkey now concentrated her attention against the Mamelukes, and by treachery and massacre overcame this troublesome but brave band. The chief personage of this, the darkest period of Egyptian history, was Mehemet Ali, who in so far as massacres were concerned showed no disposition to depart from the rule of his predecessors, but nevertheless promoted several sound projects.

#### European Intervention

The financial chaos which characterised Egypt during this period reached a climax in 1876, when the khedive suspended payment of his treasury bills. The debt of Egypt was now £91,000,000. Corruption and maladministration generally were rife, and ultimately France, Italy, and Austria each nominated representatives on the commission of public debt which had been promulgated by khedival decree. Great Britain was unwilling to interfere, although she was invited by the khedive to nominate a British commissioner, and eventually this position was offered to Lord Cromer, then Sir Evelyn Baring. Financial affairs after this European intervention improved. But a political storm was brewing



**Egypt. The Sheikh-el-Beled.**  
Wooden figure from Boulak  
*By courtesy of Chapman & Hall, Ltd*

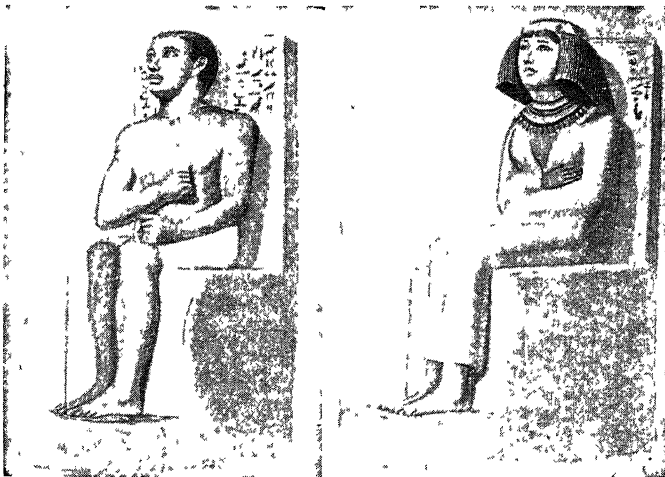
In 1879 Nubar Pasha, minister of public works, and Sir C. Rivers Wilson, the minister of finance, were assaulted by a crowd of Egyptian officers. Ahmed Arabi, an Egyptian of humble origin who had risen to be colonel of the 4th regiment, led a successful revolt of the army, and compelled the khedive to change his ministers. The country at this time had come virtually under the direction of

Arabi's party, and disturbances rendered foreign intervention necessary. Arabi's challenge by raising batteries at Alexandria with the intention of using them against the British fleet was followed by the bombardment of these batteries by the British. At Tel-el-Kebir Arabi's army was defeated and eventually surrendered. Even now the British government declined to remain in Egypt; its declared object was to establish order and stability.

#### Trouble in the Sudan

One of the difficulties of the British reformers was the trouble in the Sudan. In 1883 the Egyptian army, under the command of General Hicks, which had been sent by the British government to restore order in the more distant regions of the Sudan, was annihilated in Kordofan. The British government, reluctant to associate itself with any military enterprise in that direction, decided to abandon the Sudan and withdraw all the garrisons. In the meantime, however, Mahomed Ahmed, a religious fanatic known as the Mahdi, had risen to power. General Gordon, who was sent to report on the military situation and on the means necessary in order to accomplish the evacuation, arrived at Khartum and was killed by the Mahdi's troops in 1885. A relief expedition was sent but arrived too late. Sir Herbert Kitchener, sirdar of the Egyptian army, recaptured Khartum on Sept. 2, 1898.

The more settled state in the Sudan helped directly in the progress of Egypt, and a variety of reforms were instituted; harsh



**Egypt. Ancient sculptured figures of pyramid times from the Boulak Museum. Left, Ra-Hotep, an Egyptian prince; right, the princess Nefert, or Nefert, limestone figure**

*By courtesy of Chapman & Hall, Ltd.*

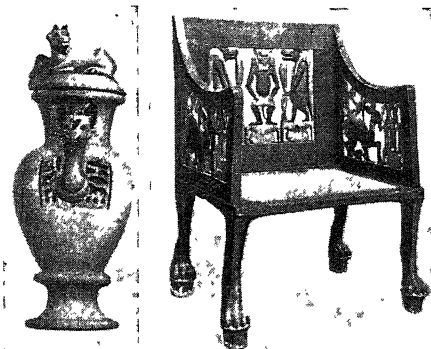
taxes were abolished, and the problems of drainage and irrigation were being solved. The contract for the construction of the Nile reservoirs was signed in 1898; post office savings banks were introduced in 1900; navigation dues on the Nile were abolished; and the Anglo-French convention was signed in 1904.

In 1907 Lord Cromer's work in Egypt came to a close, the country then experiencing prosperity unprecedented in its modern history. He was succeeded by Sir Eldon Gorst, but after a short regime, during which time a group of agitators took advantage of the friendly attitude of the new British agent, Sir Eldon broke down in health, and in 1911 Viscount Kitchener of Khartum was appointed. His efforts were directed towards increasing the water supply of Egypt by means of barrages and reservoirs; he also built roads, and succeeded in pacifying various religious and political factions. He devoted much attention to the interest of the fellah, and established cotton markets throughout the country which provided means of insuring the ignorant peasant against dishonest traders; another measure of interest to the smallholder was the Five Feddans Law, which prohibited the agricultural holdings of farmers who did not own more than five acres of land from being seized for debt.

The relationship between Lord Kitchener and the khedive was always strained, for it was known that Abbas II was not amicably inclined towards the British. In Dec., 1914, Abbas was deposed and Prince Hussein, his uncle, succeeded with the title of sultan of Egypt. Great Britain declared the Turkish suzerainty at an end, and a British protectorate was declared. Hussein died Oct. 9, 1917, and was succeeded by his youngest brother, Prince Ahmed Fuad.

During 1914-16 Egypt was on the whole prosperous and quiet, although when Turkey entered the war the country was overrun by spies and secret agents in the pay of Germany.

But the British were able to use the Egyptian army freely for policing the frontiers of the Sudan, and in the reconquest of Darfur. Egypt rendered assistance by its labour corps and camel transport,



Egypt. Alabaster vase and carved chair from the tomb of Inaa and Tuaa, 15th cent. B.C.  
From Theodore Davis, "Tomb of Touya"

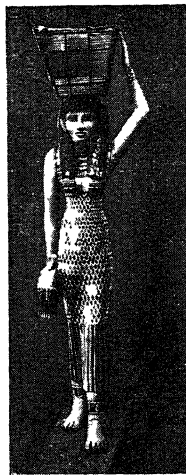
while the entry of the Egyptian Expeditionary Force into Palestine forestalled any hostile invasion.

In 1919 a group of nationalists advocated a degree of complete autonomy which would leave Great Britain only the right of supervision over public debt and facilities for shipping on the Suez Canal. The British government replied that it could not abandon responsibility for good order. Grave disturbances broke out, and Lord Allenby was appointed special high commissioner for Egypt and the Sudan. The unrest was general from Assiut to Alexandria. In both Cairo and the port outbreaks occurred in autumn. A mission went out under the colonial secretary, Viscount Milner, and negotiations lasted until 1922.

The British government on Feb. 28 that year declared Egypt an independent state. Ahmed Fuad Pasha was proclaimed king as Fuad I on March 16, and his first cabinet took office with Sarwat Pasha as premier. But independence was subject to what became known later as the "four reserved points." These points, which, until they could be regulated by mutual consent, were reserved solely to the discretion of the British government, related to the security of Imperial communications in Egypt; defence of Egypt against all foreign aggression or interference; protection of foreign interests in Egypt; and protection of minorities, and the Sudan. This was a unilateral declaration. It gave Egypt a measure of self-

government, but no effective control over foreign relations.

An election in 1924 returned the party of Zaghlul Pasha with a large majority. His avowed policy was the real independence of Egypt and the Sudan, with due respect to all foreign rights not conflicting with that independence. He visited England to demand that the Sudan should be united to King Fuad's dominions, and on the British government's refusal a serious situation arose. Disorders in the Sudan culminated in riots; General Stack, sirdar of the Egyptian army, was assassinated in Cairo. A British ultimatum demanded compensation for the outrage and a payment of £500,000 indemnity. All Egyptian officers and units were to be withdrawn from the Sudan, while reinforcements of British troops were sent to Egypt. Zaghlul resigned, and was succeeded by Ahmed Pasha Ziwari. Allenby resigned as high commissioner in 1925, and was succeeded by Lord Lloyd.



Wooden statuette, half life-size, from a tomb about 2000 B.C.  
Met. Mus., N. York

In 1926 elections were won easily by the Wafdists (Nationalists). But neither the palace nor the high commissioner wanted the Wafd in office, and recourse was had to minority governments. These being in no position to negotiate for an Anglo-Egyptian treaty to supersede the 1922 declaration, in 1928 a Wafdist-Liberal coalition, led by Nahas Pasha, took office. He was soon dismissed by Fuad, who installed Mahmoud Pasha as premier and dissolved parliament for three years.

Mahmoud Pasha made strenuous efforts to negotiate a treaty with the British, but the Wafdist opposition was too much for him. He resigned in 1929; Nahas became premier again; then the king called upon Sidky Pasha to form a government, which did obtain a majority. Sidky, however, precipitated a constitutional crisis, and virtually ruled as dictator until in 1935 reversion was made to the 1923 constitution. On April 28, 1936, Fuad died, to be succeeded by his son, Farouk (b. 1920). Partly as a consequence of internal difficulties, partly as a result of Italy's invasion of Abyssinia, a united front of all Egyptian parties was formed.



Conditions were ripe for an approach by Egypt for a treaty with Great Britain. Negotiations were begun in Cairo, the British delegation being led by Sir Miles Lampson (later Lord Killearn), the high commissioner, and the Egyptian delegation by Nahas Pasha. On Aug. 26, a 20-years' Anglo-Egyptian treaty was signed in London, agreeing on the termination of British military occupation, the entry of Egypt into the League of Nations, the exchange of ambassadors, and the right of Great Britain to retain 10,000 soldiers with 400 R.A.F. men in the Suez Canal zone. Egyptians, barred from the Sudan since 1924, were to be allowed to return. The treaty could be revised by mutual consent in 1946.

To this treaty the Egyptians were loyal when the Second Great War began. But national aspirations were rising; popular demands were made for complete independence, and for unity of the Nile valley—i.e. incorporation of the Sudan in the kingdom of Egypt; and on Dec. 20, 1945, the Egyptian govt. formally requested the opening of negotiations for the revision of the 1936 treaty. Anti-British demonstrations continued in Cairo and Alexandria; but on May 9, 1946, British and Egyptian delegations met in Cairo.

Agreement over the transfer of British military establishments in Cairo and the Nile delta was rapidly reached; begun in July, 1946, the change-over was completed on March 28, 1947, after which remaining British forces in Egypt were concentrated in the Suez canal zone.

#### Problem of the Sudan

The British recognized the sovereignty of the Egyptian crown over the Sudan during the condominium, but considered that the Sudanese when politically mature should have the right to choose, if they wished, full independence. The Egyptians demanded immediate union of the Sudan with Egypt. Matters dragged on until on Jan. 29, 1947, the premier Nokrashy Pasha announced that he had broken off negotiations and was submitting the question to the U.N. security council. That body discussed the dispute during Aug. 5-Sept. 10 before postponing further consideration of it.

In common with other members of the Arab League (*q.v.*) Egypt refused to recognize the partition of Palestine voted by the U.N. general assembly Nov. 30, 1947, and joined in the invasion of that

country at midnight of May 14-15, 1948, when the British mandate expired. During Oct. fighting developed in the Negeb. Damped down by the security council's order of Oct. 19 for a cease fire, it broke out again in Dec., Israeli forces penetrating 10 m. inside the Egyptian frontier, and shooting down, on Jan. 8, 1949, five R.A.F. aeroplanes on reconnaissance along the frontier. Negotiations in Rhodes conducted by Dr. Bunche, the U.N. mediator in Palestine, led to the signing of an Israeli-Egyptian armistice on Feb. 24.

On Dec. 8, 1948, Nokrashy Pasha ordered the dissolution of the Muslim brotherhood, an ultra-nationalist body responsible for much of the unrest in post-war Egypt. On the 28th he was assassinated by a member of the proscribed organization. His finance minister took over the premiership. Elections held on Jan. 3, 1950, gave the Wafdists (who had boycotted the elections of 1945) 225 seats out of a total of 319. Their leader Nahas Pasha immediately formed a new cabinet.

**CONSTITUTION AND GOVERNMENT.** Before 1913 the affairs of Egypt were controlled by two public bodies known as the legislative council and the general assembly. These bodies dated from 1882 and were in the main consultative only, legislation being in the hands of the khedive and his ministers. In 1913 the council and assembly were replaced by a new legislative assembly of 66 members elected by the people (but by an indirect vote), the ministers, and 17 nominated members. In 1923 a new constitution introduced cabinet responsibility and a parliament of two chambers, the senate as to two-fifths appointed by the king, the rest and the members of the lower house being elected on a basis of universal male suffrage. In abeyance from 1930, this constitution was restored in 1935.

**JUSTICE.** Until 1949 international (or mixed) courts, set up in 1876 under capitulatory rights dating from the time of the Ottoman empire, tried all civil cases in which foreigners were involved, up to 1937 under laws based on those of France. A foreigner accused of a criminal offence went until 1937 before his own consular court. Egyptian national courts, set up 1883 to deal with cases involving only Egyptians, modelled their methods on the excellent practice of the mixed courts; but developing national sentiment made the

existence of foreign courts a growing offence to Egyptians, and by a convention signed at Montreux May 9, 1937, the capitulatory powers agreed to abolish capitulations; and the former penal jurisdiction of the consular courts was transferred to the mixed courts, which were to come to an end in 12 years. New codes, applicable to both mixed and national courts, were promulgated, 1937; and on Oct. 14, 1949, mixed courts ceased to exist.

The national courts comprise summary tribunals, under one judge, for lesser offences; central tribunals, with three judges each, for more serious offences; three courts of appeal, at Cairo, Assiut, and Alexandria; a court of cassation, above the appeal courts, set up 1931; and one function of the council of state established 1946 was that of supreme court.

**EDUCATION.** Egypt possesses three universities: Al Azhar in Cairo, oldest university in the world, which attracts thousands of students from the whole world of Islam and has extended its curriculum to embrace modern languages in addition to Koranic learning; the King Fuad university in Cairo, founded 1908 and taken over by the govt. 1925; and the King Farouk university in Alexandria, founded by the govt. 1943. In 1947 there were 21,000 university students, 64,000 pupils in secondary schools, and over a million in primary schools. Arabic is the general medium of instruction; French and English are compulsory subjects.

**INDUSTRY.** The Egyptian is an agriculturist. Ancient Egypt was the granary of the Roman world, and exported great quantities of corn. With the coming of the Turks a different order of things was created, and a long period of depression and misery followed. The revival of Egyptian industry began with the elimination of the Turk by the British. Vast schemes of irrigation and drainage were developed until the cultivable area of Egypt proper was reckoned in 1918 at over 8,000,000 acres; at the time of the French occupation in 1798 the cultivable area totalled 3,520,000 acres.

Egypt, as the first sultan said, has three assets—the Nile, the Egyptian sun, and the fellah. Full use is made of both the sun and the Nile by the fellah. The sun shines all through the year, and the Nile is stored up so as to be available in any season. In addition, the fellah is extremely

hard-working, and it is towards helping him in making the fullest use of the Nile that British brains and science have been directed. In the past the fellah had to wait upon the flood-tides. Nowadays, instead of obtaining water for his land for only a portion of the year, he obtains a regular and sufficient supply all the year round. The whole system is being directed towards perennial irrigation—thus assuring two and often three crops every year.

Where perennial irrigation is impossible, the basin system has been adopted, whereby water is stored in Aug. and kept in reserve till Oct. when it begins to be used. The basin system is the oldest system of irrigation known to Egypt. Only one crop a year can be grown from it. Another system is used on the high lands near the Nile. These lands cannot be reached through canals, so a system of pumping the water is utilised. The British use of steam-pumps has been largely developed; but the water-wheel, worked by buffaloes, or the water-lift (*shaduf*), worked by hand, is still in favour with the conservative fellahs. There are three agricultural seasons: cotton, sugar, rice, and, in a lesser degree, millet and vegetables, are grown in summer; wheat, barley, flax, and vegetables in winter; maize, millet, and flood rice are grown between August and November.

#### Factors in Egypt's Prosperity

Egypt's potentialities have not been by any means fully tapped. But production of oil (she produced over a million and a quarter metric tons in 1943) and of manganese ore, for instance, and the growing of tobacco are being steadily developed. It is believed that gold, and, more certainly, ores will be found alike in the deserts and near the Nile valley. The country waxed fat during the Second Great War, by supplying the needs of a large British army. But cotton remains the basic factor in Egyptian prosperity. In 1944 she produced 209,000 metric tons of cotton, compared with 2,322,500 tons of maize, 946,000 tons of wheat, 814,600 tons of rice, 226,800 tons of barley, 4,000 tons of ground nuts, and 322,400 tons of beans. In 1945 her exports amounted to £41,600,000 and her imports to £59,700,000. The export possibilities of onions, sugar, and dates are being intensely studied. Nor should the drive for further industrialisation in Egypt itself be overlooked, particularly when

sources of hydro-electric power are made available.

The lines of commercial communication to Egypt are, by virtue of the country's geographical position, the most important in the world. Besides being a distributing centre for the Levant, it holds a commanding position on the trade routes from Europe to the East. By the completion of the Suez Canal in 1869, a direct sea route was opened up between the Mediterranean and the Red Sea. Considerable use is made of Alexandria and Port Said by foreign steamship companies. Passenger traffic is at its height in the winter when there is an influx of tourists seeking pleasure or health. The latest available figures for the railway system, which forms the N. section of the Cape to Cairo scheme, are 3,686 m. (state-run); for main roads, 1,393 m., and for secondary roads, 4,497 m. Air services have naturally centred on Egypt, which has its own *Misr* Airways operating both to Europe and to the Middle East.

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**Egypt.** British P. and O. line steamship (7,912 tons), sunk, May 21, 1922, in a collision off the French coast with a loss of 86 lives. With over £1,000,000 of bullion aboard, she lay at a depth of 426 ft. Between June, 1932, and Aug., 1934, an Italian firm, the Sorima coy., recovered the bulk of the bullion.

**Egyptian Hall.** London place of amusement, 1812-1904. Situated at 171, Piccadilly, W.1, it was built in 1812 by G. F. Robinson, for the natural history collections of William Bullock, F.S.A., dispersed in 1819. Here were exhibited the Living Skeleton (Claude Amboise Seurat), in 1825, and the Siamese Twins, in 1829. B. R. Haydon (q.v.), in 1846, complained that while in one week "Tom Thumb" (C. S. Stratton) attracted 12,000 people, his own picture exhibition drew 133½—the ½ being a little girl. Later the hall was a centre for such entertainments as those of Albert Smith, Artemus Ward, and "Mrs. Brown." From

1873 until 1904 when he removed to St. George's Hall, Langham Place, J. N. Maskelyne made it "England's Home of Mystery." For many years the exhibitions of the Dudley Gallery Art Society were held here. The figures of Isis and Osiris at the entrance were by Gahagan.

**Egyptology.** The study of the civilization of ancient Egypt in all its aspects. The period covered begins with man's arrival in the Nile Valley and ends with the latest hieroglyphic inscriptions in the 4th century A.D. The subject thus overlaps with the study of Coptic, the form of the ancient Egyptian language which, written in Greek characters with the addition of five borrowed from Demotic, became the vehicle of Christian writings from the 2nd century, and which has continued in use in the Coptic (Christian) Church in Egypt till today.

Despite one or two earlier attempts to decipher the hieroglyphs with the aid of Coptic, and a few travellers' records from the 18th century, scientific observation of ancient Egyptian remains began only with the archaeologists attached to Napoleon's mission to Egypt in 1798: and no great progress was made until Champollion announced his discovery of the principles of the decipherment of hieroglyphic writing in 1823. The first 30 years of the 19th century also saw the formation in European capitals of the nuclei of the great collections of Egyptian antiquities. But while linguistic study developed steadily and inscribed monuments came to be treated with respect, the archaeological significance of the thousands of smaller objects continually being brought to light up and down Egypt was barely perceived until Flinders Petrie made his first expedition to the country in 1880. Mainly through his efforts, in the next 20 years excavation in Egypt developed to the high standard it has now reached, and archaeological and linguistic evidence cooperated with and controlled each other in revealing the ancient civilization.

Egyptology became an academic subject with the foundation of a professorship at Berlin in 1842. Fifty years later the first chair of Egyptology in England was created for Petrie in London. Chairs were also established in most European countries, at three or four universities in the U.S.A., and in Cairo, in addition to

posts of academic standing in museums possessing Egyptian collections. In 1939 excavations were being carried out under licence from the Egyptian government by museums or scientific societies from Great Britain, France, Germany, Belgium, Italy, Poland, and the U.S.A. Some of these had already resumed work in Egypt by 1947. This work, however, is gradually being taken over by Egypt's own department of antiquities which, originally staffed throughout its upper ranks by Europeans, now consists almost entirely of Egyptians.

In 150 years since Napoleon's expedition, a vast scientific literature has sprung up. It has already far outgrown the point at which individual students can keep up with every aspect of Egyptological studies, despite the aid of modern bibliographical methods; with the result that the word Egyptologist is now a catholic term which embraces scholars in various fields who are compelled to be specialists and confine themselves more or less to the archaeological, the aesthetic, or the linguistic side of the subject.

S. R. K. Glanville, F.B.A., F.S.A.

**Ehrenbreitstein.** A town of Germany. It stands on the right bank of the Rhine opposite Coblenz. Until 1919 it was a strong fortress, a rock nearly 400 ft. in height overlooking the Rhine and the Moselle being the centre of the system of fortifications. Originally a Roman *castellum*, it became the property of the Treves electors, and was fortified by Eugene of Savoy in 1734. It was besieged frequently by the French, and demolished by Napoleon in 1801. It fell to Prussia in 1815, was refortified, and after 1870 modernised. In 1919 under the Versailles treaty the fortress was destroyed. The pop. of some 3,500 were up to 1939 engaged in the wine trade and shipping.

**Ehrenburg,** ILYA GRIGORIEVICH (b. 1891). Russian writer. Educated in Russia, he began his literary career at 20, and during the First Great War acted as war correspondent. Returning to Russia during the revolution in 1917, he later lived mostly in France. In the Second Great War he was again a correspondent and broadcast regularly from Moscow. Influenced by Gorki, his novels and stories were remarkable for their vivid characterisation. The best known include *Out of Chaos*, *Trust D.E.*, *A Street*

in Moscow, *The Loves of Jeanne Ney*. In 1942 (for *The Fall of Paris*) and in 1948 (for *The Storm*) he received the Stalin prize for literature.

**Ehrlich,** GEORG (b. 1897). An Austrian etcher and sculptor. A Viennese, he was educated at the Vienna school of arts. Awarded a gold medal at the Paris art exhibition of 1937, he emigrated that year from Austria to live in London. His busts—among them a notable one of the actress Elisabeth Bergner—water-colours, drawings, and etchings were exhibited in many international galleries, at the Royal Academy from 1940 regularly. The Tate Gallery has his bronze head of a boy, and President F. D. Roosevelt owned a donkey in bronze by Ehrlich.

**Ehrlich,** PAUL (1854–1915). German physiologist, born of a Jewish family at Strehlen, Silesia. March 14, 1854.

Prolonged experimental researches brought him world-wide renown, and in 1908 he shared with Metchnikov the Nobel prize for physiology and medicine. In 1899 he became director of the Speyer Institute of experimental therapeutics at Frankfurt, which he made famous by his laboratory work in connexion with cancer. The founder of chemotherapy Ehrlich also laboured to discover a safe and effective cure for syphilis, being latterly assisted by a Japanese doctor, Hata. It was not until 606 experiments had been made that in 1910 real success was in sight; the compound then discovered being called 606 or salvarsan. Ehrlich also invented new bacteriological stains, was one of the founders of serum therapy, and did important work on diphtheria antitoxin. He died Aug. 20, 1915.

**Eibar.** Manufacturing town of Spain, in the prov. of Guipúzcoa. It is 39 m. by rly. W.S.W. of San Sebastian. It makes guns, swords, bicycles, and sewing machines, and is noted for its damascened arms and other metal ware. Pop. 12,140.

**Eichendorff,** JOSEPH, BARON VON (1788–1857). German poet and novelist. He was born at Lubowitz, March 10, 1788, near Ratibor, Silesia, a member of a noble Catholic family. He published his first romantic novel, *Ahnung und*

*Gegenwart*, in 1815. Aus dem Leben eines Taugenichts, 1826, is well known; but Eichendorff ranks above all as a poet, his simple nature lyrics having taken their place in German popular song. He served against France, 1813–15, during 1820–44 occupied various public appointments, and in his later years was distinguished as a Catholic publicist. He died at Neisse, Nov. 26, 1857. His *Collected Works* (6 vols.) appeared in 1864.

**Eichhorn,** JOHANN GOTTFRIED (1752–1827). German scholar. He was born at Dorrenzimmern, Oct. 16, 1752, and in 1775 was appointed professor of Oriental languages at Jena, and in 1788 at Göttingen, where he lectured for the rest of his life, dying June 27, 1827. He was the first scholar to suggest that the synoptic gospels have one common source, and was a pioneer of the rationalist criticism of the Bible.

**Eichhorn,** KARL FRIEDRICH (1781–1854). German jurist. Born at Jena, Nov. 20, 1781, son of the above J. G. Eichhorn, he studied at Göttingen and lectured on law at Frankfurt-on-the-Oder, and obtained a professorship at Berlin. He fought against France in 1813, and after 1815 was professor at Göttingen and at Berlin. In his later years he held high positions in the public service. He died at Cologne, July 4, 1854. Eichhorn is perhaps the greatest authority on the laws and institutions of the Germans. Besides his great *Deutsche Staats- und Rechtsgeschichte* (1808–23) he wrote on private and ecclesiastical law, and helped to found a legal periodical.

**Eichstätt.** Ancient town of Bavaria, Germany. It stands on the Altmühl, 15 m. N.W. of Ingolstadt. Founded by S. Boniface in 740 and having urban rights since 908, it is chiefly famous for old buildings and episcopal associations, for its bishops were princes of the empire until their lands were secularised in 1802. The cathedral, which is dedicated to S. Wilibald and contains the tomb of that saint, is largely Gothic, but its towers are Romanesque. Among the other churches the most notable is S. Walpurgis, dating from the 17th century, which holds the saint's tomb and is visited by pilgrims on S. Walpurgis' day (May 1). There is a palace where the bishops and later the dukes of Leuchtenberg lived; this is now used as a law court, while another palace is used as a library and

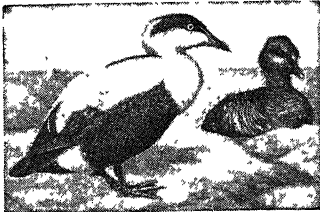


Paul Ehrlich.  
German physiologist

museum. Above the town is the Wilibaldsburg, once also a residence of the bishops, but now a museum. From 1817 to 1855 Eichstätt was part of the duchy of Leuchtenberg; thereafter Bavarian. Pop. 8,160.

**Eider.** River of Schleswig-Holstein, Germany. It rises near Kiel, and flows N.W. and W. across the peninsula to Tönning, where it forms a bay. Its length is about 115 m. Before the opening of the Kiel Canal it was important for navigation. Vessels could go along it as far as Rendsburg, whence a canal took them to Kiel, thus uniting the Baltic and North Seas. This canal developed into the Kiel Canal.

**Eider Duck** (*Somateria*). Genus of wild duck. Including several species, it is famed for its soft

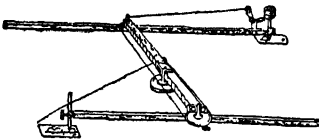


Eider Duck. Male, black and white; female, mottled brown

down, which it uses for lining its nest. Eiders have comparatively short beaks; the males have black and white plumage with green markings on the head, while the females have mottled brown plumage. The common eider (*S. mollissima*) is resident in Great Britain throughout the year, but breeds only on the Farne Islands. The king eider (*S. spectabilis*) and Steller's eider (*Polysticta stelleri*) are rare visitors.

All the eiders are divers, and feed upon shell-fish and small crustaceans. They keep to the rocky shores and nest on the ground. A pound of down can be obtained from about six nests.

**Eidograph** (Gr. *eidos*, form; *graphein*, to write). Instrument for copying drawings, designs, etc., reduced or enlarged, within limits, to any desired proportion. Somewhat on the lines of a pantograph,



Eidograph. Diagram of the instrument. The arms bearing tracer and pencil respectively move parallel in all directions, the connecting beam resting on a fulcrum

it comprises a slotted beam adapted to slide in a socket, having its axis in the centre line of the slot. Underneath each end of the beam is a wheel; the wheels are of the same diameter and geared together by a chain. Sliding in a guide in each wheel is an arm, one of which carries a tracer and the other a pencil, or the equivalent, for copying. The gearing together of the two wheels ensures that the arms will remain parallel for all positions of the instrument. The size of the copy is determined by the position of the beam in the socket.

**Eifel.** Plateau region of Germany, with small mt. ranges rising above it. Of low altitude (highest peak 2,500 ft.), they trend E. by S. between the Nette and the Ahr rivers towards the Rhine and the Moselle. The E. section is known as the Hohe Eifel, the W. section as Schnee Eifel, while the S. part, most pleasing scenically and most interesting geologically, is called Vorder Eifel. Near Cochem, on the steep wooded banks of the river Eltz, stood the castle of Eltz, a beautiful medieval building of wood and plaster, burnt in 1920. The area, left with only the *Volkssturm* to defend it, was conquered by the U.S. 1st and 3rd armies during the first week in March, 1945.

**Eifelian.** Name given to a stage of stratified rocks of Middle Devonian age. It consists of flagstones, shales, and beds of limestone attaining a thickness of 500 ft. in the Dinant district (Belgium). One series of shales (the Calceola shales) is named after a peculiar form of coral. It is well developed in Germany—in the Eifel district, whence the name, in the Rhine valley, the Hunsrück, the Taunus—and also in Bohemia.

**Eiffel, ALEXANDRE GUSTAVE** (1832–1923). French engineer. Born at Dijon, Dec. 15, 1832, he studied at the École Centrale, and executed his first notable work, the bridge over the Garonne at Bordeaux, in 1858. In 1865

he founded ironworks at Levallois-Perret, Seine. His outstanding engineering achievements include the bridge over the Douro at Oporto, 1876; the Garabit viaduct, Cantal, 1882; the great

Eiffel Tower, Paris, 1887–89; the movable dome of the Nice Observatory; and the frame work for Bartholdi's colossal statue of Liberty in New York harbour. He was one of the first engineers to use compressed-air caissons in bridge building, and invented movable section bridges. His investigations of air resistance were of service in the development of aeronautical engineering. He died in Paris, Dec. 28, 1923.

**Eiffel Tower.** Building in Paris. It was designed and erected by Gustave Eiffel, for the Paris exhibition of 1889. It is 984 ft. high, and is built of iron through-



Eiffel Tower, Paris. It is 984 ft. high

out, 7,300 tons of that metal being used in its construction. The shape is that of a curved pyramid. Electric lifts take tourists to the top. The tower became an important wireless telegraphy station and meteorological centre.

**Eigen Function.** One of a set of solutions of a differential equation, e.g. Schrödinger's equation, such that any solution of this equation can be represented as a linear combination of members of this set. See Wave Mechanics.

**Eiger.** Mountain of Switzerland, in the Bernese Oberland (q.v.), adjoining the Mönch; alt. 13,042 ft. It was first ascended by Charles Barrington, 1858.

**Eigg** or **Egg.** Island of the Hebrides, Inverness-shire, Scotland. It lies about 4 m. S.E. of Rum, facing the entrance to the Sound of Sleat, and is 6½ m. long and 4 m. broad. In the S.W. is the Scur of Eigg, a porphyritic peak 1,289 ft. high. The rocks have been described by Hugh Miller, the Scottish geologist, in his Cruise of the Betsy. *Prom. Egg.*

**Eight.** In rowing, a name applied collectively to the members of a racing crew, when such consists of eight men, in addition to the cox. For the Oxford and Cambridge and other important boat races it became usual to have crews of eight, and so in course of time the word came to be used in this sense. See Rowing.



Gustave Eiffel, French engineer

**EIGHT, PIECE OF.** Name given to the old Spanish silver coin, the *piastre*; it was so called because it was divided into eight silver *reals*. It circulated in Spain and Spanish America during the 17th and 18th centuries, and was commonly met with through W. Europe. Its value was about four shillings.

**Eighteenth Amendment, THE.** Famous modification of the constitution of the U.S.A., enforcing

prohibition. This article of amendment became effective on Jan. 16, 1920, one year after its ratification. It prohibited the manufacture, sale, transport, import, or export of intoxicating liquors for drinking purposes, and was held to be largely responsible for the subsequent rapid growth of gangsterdom in the U.S.A., particularly in the eastern towns and cities. The amendment was repealed on Dec. 5, 1933. *See* Prohibition.

## EIGHTH ARMY: FAMOUS BRITISH FORCE

Harry Gregson, formerly Editor of Eighth Army News

*Few British armies captured the imagination of the public as did the 8th, especially in the days when it was fighting in the desert and advancing rapidly from Alamein (q.v.) to Tunis. See also North Africa Campaigns; Montgomery; Second Great War; Tobruk, etc.*

The first British army to undertake large scale offensive operations against the Axis in the Second Great War was the 8th army; and its victory at Alamein against the combined German and Italian forces threatening Egypt was the first great success of British land troops, and a decisive battle of the world conflict. With the battle of Stalingrad, it marked the turning point in the fortunes of the Allies.

### First Offensive

Formed in Nov., 1941, from a nucleus of troops experienced in desert warfare, the 8th army, under Lieut.-Gen. Sir Alan Cunningham (replaced a few days later by Maj.-Gen. Neil Methuen Ritchie), opened its first offensive against the Axis in Libya on Nov. 18. Tobruk, beleaguered by the enemy since April, was relieved; Benghazi fell on Christmas eve, Bardia and Halfaya were captured in Jan., 1942. Then in April came retreat before General Rommel, the disastrous battle of Knightsbridge (q.v.), the gallant but vain Free French defence of Bir Hakeim (q.v.), followed by the breakthrough of the German and Italian forces, the loss of Tobruk on June 22, of Mersa Matruh a week later, and the advance of the Axis forces to Alamein, some 60 miles only from Alexandria. The 8th army had lost 80,000 men, and been driven back 400 miles in less than two months, Rommel's rapid advance having been made possible by the use of captured British stores and vehicles.

At this critical juncture the c.-in-c., Middle East, General Sir Claude Auchinleck, took over tactical command of the 8th army, and succeeded in stabilising a front. At the beginning of Aug.

Winston Churchill, who said later, "I had some reason to believe that the condition of the desert army was not entirely satisfactory," visited Cairo, where "it was clear to me that the army must have a new start under new leaders." General Sir Harold Alexander became c.-in-c., Middle East, and Lieut.-Gen. B. L. Montgomery was appointed to command the 8th army.

Under its new commander, the 8th in the early days of Sept. held an armoured thrust, between Ruweisat and El Hemeimat, aimed at Cairo. Then on Oct. 23 came the attack at Alamein which initiated the victorious battle of Egypt, and the 8th army's 80-day advance in pursuit of a demoralised enemy across the N. African desert to Tripoli (occupied Jan. 13, 1943), 1,400 m. to the W. The 8th army entered Tunisia in the last days of Jan., overcame the Mareth Line (q.v.) in March, crossed the Wadi Akarit on April 6, and next day W. of Gabes made contact with American forces advancing from N. Tunisia.

### Victory in Tunisia

At this point all the Allied forces in N. Africa came under the supreme command of Gen. Eisenhower, Alexander assuming fighting command of the British 1st army, the Americans, and the French troops in Tunisia as well as of the 8th. Tunis itself fell on May 7, the 11th Hussars (8th army) and the Derbyshire Yeomanry (1st army) being the first British units to enter the city. On May 16, Alexander sent a message to the prime minister, "Sir, It is my duty to report that the Tunisian campaign is over. All enemy resistance has ceased. We are masters of the N. African shore"

Preparations for the invasion of Sicily began immediately, and on July 10 the 8th army, now including the Canadian 1st division, made a landing in S.E. Sicily in conjunction with the U.S. 7th army. Sicily was conquered by Aug. 17, and on Sept. 3 British and Canadian troops of the 8th army landed on the Italian mainland, in Calabria. Fourteen days later they established contact at Agropoli with the hard-pressed 5th army, which had landed at Salerno. Other 8th army troops landed at Taranto had secured that port and Brindisi, and were advancing up the east coast of Italy.

Following the occupation of Naples (by the 5th army) on Oct. 1, while the 5th army continued to advance northward to the west of the Appennines, the 8th army advanced to the east of them until in May, 1944, the bulk of it was transferred westward to take part in the final battle of Cassino (q.v.) and the capture of the Gustav Line. It continued to fight through the mountainous backbone of Italy and up the east coast, occupying Florence and breaking the Gothic Line in Aug., capturing Rimini in Sept., Ravenna in Dec. In April, 1945, it helped to take Bologna, and, crossing the R. Po in an encircling movement, trapped the main body of the German army S. of that river. It entered Trieste on May 2 and received the surrender of the German commander; crossed into Austria on May 7. It was disbanded July 29, 1945.

### Commanders of the Eighth

When Montgomery left Italy in Jan., 1944, to prepare for the invasion of N. France, Lieut.-Gen. Sir Oliver Leese took over command of the 8th army. Transferred to S.E. Asia in Nov., 1944, he was succeeded in the command of the 8th by Lieut.-Gen. Sir Richard L. McCreery. Few armies in British history have captured the imagination of the world as did the 8th. Under Montgomery's inspiring command, it achieved successes scarcely equalled on any other front. By moving among the men, Montgomery made himself personally known to them; before major battles he explained to them the principal objects of his strategy—unusual characteristics in a general which helped materially in creating the sense of unity that was the 8th army's strength.

During the fighting in N. Africa the 8th army was composed in the main of British and Empire formations. These included at

different times the 7th armoured division (called Desert Rats from their divisional flash, a jerboa), the 51st (Highland) division, the 50th (Northumbrian) division, the 44th (Home Counties) division, the New Zealand 2nd division, the 4th Indian division, the Australian 9th and the S. African 1st divisions. Canadian, Polish, Italian, Greek, and Brazilian units served with it in Italy.

**Eights Week.** Popular name at Oxford for a period which includes a series of bumping races for college boats—the Oxford Summer Eights. The week begins on a Thurs. in May and ends the following Wed. Usually several crews are entered by each college and the races are rowed in divisions throughout each afternoon except Sunday. Eights Week is a social occasion in the university; with it are associated concerts and entertainments apart from the picturesque scene on the river.

**Eighty Club.** British political club. It was founded in 1880 to celebrate the victory gained by the Liberals at the general election of that year, its main object being to unite the younger members of the Liberal party and to encourage them in active political work. A president, usually a leader of the Liberal party, is elected annually. Women members were admitted in 1920. The club's headquarters are at 36, Victoria St., London, S.W.1.

**Eijkman, CHRISTIAAN** (1858–1930). Dutch pathologist. Born Aug. 11, 1858, at Nijkerk, Gelderland, he became an army surgeon. He took part in 1886 in a scientific expedition to the East Indies for an investigation of the beri-beri disease, and was made director of the pathological laboratory at Batavia, where he stayed until 1896. Here, by the experiment of feeding one hen on polished rice, another on unpolished, he established that beri-beri was due to a deficiency of some substance (later identified and named vitamin B1) which is present in the husk of rice grains. With F. Gowland Hopkins (*q.v.*) he was awarded the 1929 Nobel prize for physiology and medicine. As professor of hygiene at Utrecht from 1898 to 1928 he devised a process for detecting the bacillus coli in water. He died Nov. 5, 1930.

**Eikon** (Gr., image). Holy image or sacred picture used in the worship of the Greek Church, more usually spelled Ikon or Icon (*q.v.*).

**Eikon Basilike** (Gr., royal likeness). Book purporting to be written by Charles I, and published

immediately after his execution, although most of the early editions bear the date 1648. Its sub-title is *The Pourtraicture of His Sacred Majestie in His Solitudes and Sufferings*. It professes to give the king's views of the events of his reign, and a number of his prayers. Milton, in *Eikonoklastes*, replied in detail to the work and first hinted at doubts as to its authorship. Historians take sides for Charles or for John Gauden, later bishop of Worcester, who claimed to have written it. There are editions by C. M. Phillimore, 1879; and E. Almack, 1904; consult also *Bibliography of the King's Book*, E. Almack, 1896.

**Eil.** Sea-loch between Argyllshire and Inverness-shire, Scotland. Forming a W. extension of Loch Linnhe, it is 8 m. long and has a mean breadth of  $\frac{1}{2}$  m.

**Eildon Hills.** Range of hills in Roxburghshire, Scotland. Situated S. of Melrose, they rise into three peaks, the highest of which is 1,385 ft. On the slopes are a supposed Druidical tumulus and remnants of a Roman encampment. According to popular tradition, the single hill was split into three by the "wondrous wizard," Michael Scott of Balwearie.

**Eileithyaspolis** or **EILEITHYIA**. City of ancient Egypt. It has been identified with the present El Kab, on the E. bank of Nile, 44 m. above Luxor. The goddess of the town, Nekhet, was regarded by the Greeks as identical with Eileithyia, the goddess of childbirth, hence the Greek version of the Egyptian name (Nekhab) of the city. The ruins are extensive.

**Eilenburg.** Town of the German province of Saxony. It stands on the left bank and an island of the Mulde, 15 m. N.E. of Leipzig, and is a rly. junction. It is a centre of the textile industry, and also manufactures chemicals, pianos, furniture, and agricultural machinery. The castle, after which it is named, dates from the 10th century, but the town, known earlier as Ilburg, is older. It was part of Meissen and then of Saxony, in which it remained until given to Prussia in 1815. Pop. (pre-war) 19,500.

**Eimeo.** One of the Society Islands in the Pacific Ocean. It lies to the N.W. of Tahiti, in lat. 17° 32' S. and long. 150° 2' W., and is a French possession. It is 9 m. long and 5 m. broad; area, 51 sq. m. The London Missionary Society has a station and a college on the island.

**Einaudi, LUIGI** (b. 1874). Italian president. See N.V.

**Eindhoven.** Town of the Netherlands, in North Brabant. It lies 8 m. W.S.W. of Helmond and is a rly. and an important road junction. With fewer than 5,000 inhabitants in 1900, it developed into an industrial centre and became the seventh town of the Netherlands, with a population of 111,179 in 1939. A centre of the electric bulb industry, it has also radio, textile, and tobacco manufactures.

In the Second Great War it was frequently attacked by Allied bombers: the radio factory there, the largest of its kind in Europe, was an important source of supply for the German army. The U.S. 101st airborne div. was dropped between Eindhoven and Grave on Sept. 17, 1944, in connexion with the attempt to make an airborne crossing of the Lower Rhine (see Arnhem, battle of). The British 2nd army reached the airborne forces and liberated Eindhoven, first large Dutch town to be freed, next day. The Luftwaffe bombed the town on the night of Sept. 19–20.

**Einhard, or EGINHARD** (c. 770–840). Frankish historian. Born in East Franconia, he was educated at the monastery of Fulda and at the court of Charlemagne, where he was a pupil of Alcuin. He was made secretary and superintendent of public buildings by Charlemagne and was responsible for the royal palaces at Ingelheim and Aix-la-Chapelle. He continued to enjoy favour under Louis, Charlemagne's successor, who entrusted him with the education of his son Lothair, and in 815 bestowed on him the domains of Michelstadt and Mülheim. In 827, unable to compose the quarrels between the emperor Louis and his sons, Einhard retired from court to Mülheim, where he founded a monastery, and died March 14, 840. His wife was Emma, sister of the bishop of Worms, and not a daughter of Charlemagne, as later legends represent. His chief works are his *Epistolae*, and his *Life of Charlemagne*, one of the best biographies of the Middle Ages, and the source of most of our information about the great emperor (Eng. trans. A. G. Grant, 1905; H. W. Garrod, 1915). His authorship of the *Annales Regum Francorum* is disputed.

**Einsiedeln.** Town of Switzerland, in the canton of Schwyz. It stands on the Albach, 2,908 ft. above the sea, 25 m. by rly. S.E. of Zürich. One of the most famous pilgrim resorts of the world, it owes its importance to the great



Benedictine monastery, containing a miraculous black wooden image of the Virgin. The abbey was founded in 934, but rebuilt in the 18th century; the French sacked the place in 1798, but the treasury and library, with 50,000 vols. and valuable MSS., still contain many precious objects, portraits, etc. Thronged in the Middle Ages, it still attracts thousands of pilgrims annually. Zwingli was a parish priest here.

**Einstein, ALBERT** (b. 1879). German-born American physicist. He was born at Ulm, March 14, 1879, of Jewish parentage. His school days were passed at Munich, which he left at 16 to pursue his studies at the Zürich higher technical school (1896-1900). In 1901



Albert Einstein,  
American physicist

Einstein was naturalised as a Swiss, and accepted a post in the patent office at Berne. While here he published many scientific papers dealing with such subjects as the Brownian movement, the "quantum" theory of energy, and, what attracted the greatest attention, the theory of relativity (q.v.). In 1905 Einstein formulated his own theory of relativity in its narrower or "special" form, and this formulation at once raised him to a high place among European scientists. In 1909 he was appointed professor at Zürich, and in 1911 he left Zürich for Prague, where he was professor of physics in the German section of the university.

In 1912 Einstein returned to Zürich as professor at the technical university and in 1914 went to Berlin as a member of the academy of science. In 1915 he caused a sensation in the scientific world by his explanation of gravitational attraction, based on the wider or "general" form of his theory of relativity, and accompanied by an explanation of the anomalous motion of the planet Mercury. He then made a remarkable prediction as to the bending of light rays from the stars which passed close to the sun; the verifying of this prediction by the British solar eclipse expeditions in 1919 made Einstein world famous.

His position in the world of science became ever stronger, and he was widely ranked with Newton among the world's thinkers. He was elected a foreign member of the Royal Society in 1921, and

that year was awarded the Nobel prize for physics. The publication in 1929 of two papers on a united field theory marked an important step in the application of the theory of relativity to the province of electro-magnetism. Einstein was abroad when the Nazi regime was set up in Germany, and in view of the persecution to which Jews were exposed he refused to return to the country of his birth, publicly renouncing his allegiance. All his property was confiscated. He retired to England, where he remained in semi-secrecy, but made public appearances at mass meetings against Nazi persecution. He later went to the U.S.A., where he was professor of theoretical physics at Princeton, becoming an American citizen 1940. He made public his generalised theory of gravitation in Dec., 1949.

Einstein's books are written in German and are extremely technical. The most popular of them, however, was translated into Eng-

lish as *The Meaning of Relativity* in 1922. His other works include *Why War?* (with S. Freud), 1933; *My Philosophy*, 1934; *The World as I See it*, 1935; *The Evolution of Physics* (with L. Infeld), 1938. *Consult Einstein the Searcher*, A. Moszkowski, 1921; *Lives*, A. Reiser, 1931; *D. Reichinstein*, 1934; *H. G. Garbedian*, 1939.

**Einthoven, WILLEM** (1860-1927). Dutch physiologist. He was born May 21, 1860, at Samarang, Java, and educated at Utrecht. Professor of medicine and physiology at Leiden from 1886 until his death, Sept. 28, 1927, he specialised in devising methods for exploiting electricity in diagnosis of disease. In 1911 he invented a string-galvanometer, the basis for the electro-cardiograph. In 1924 he was awarded the Nobel prize for physiology and medicine in recognition of the great progress made through his inventions in the treatment of heart diseases.

## EIRE: A BRITISH ISLES REPUBLIC

**N. Mansergh, D.Phil., Author of Britain and Ireland, etc.**

*This article deals with that part of Ireland which became known as the Irish Free State in 1922, and as Eire in 1937. Its physiography and geography, and the history of the whole island up to 1922, are given under Ireland. For the history of Northern Ireland since 1922, see Northern Ireland. See also Irish Republican Army; Sinn Féin, etc.; and Collins; De Valera; Griffith, etc.*

Eire is 17,024,485 acres in area. In 1944 about a third of this area was under crops. The principal produce was wheat 546,114 tons; oats 779,820 tons; and barley 152,536 tons. Livestock included 4,245,936 cattle and 2,663,062 sheep.

The population in 1946 was 2,953,452. The density of population is 111 per sq. m. The principal cities are Dublin, the capital, Cork, Limerick, and Waterford.

**RELIGION.** According to the 1936 census there were 2,773,920 Roman Catholics; 145,030 Church of Ireland; 28,067 Presbyterians; 9,649 Methodists.

**COMMUNICATIONS.** Rail and road communications are good. In 1944 there were 2,493 miles of railway. Main lines under the Córás Iompair Éireann radiate from Dublin to Cork, Limerick, Galway, and Waterford. There is also the Great Northern rly. line from Dublin to Belfast.

The principal harbours are Dublin, Cobh, Dun Laoghaire (Kingstown), Cork, Galway, Rosslare, Limerick. Cross channel services run regularly between Holyhead and Dun Laoghaire; Liverpool and Dublin; Fishguard and Rosslare. Waterford and Cork.

There is also a regular service by aeroplane between London and Dublin airports. From Shannon airport (Rineanna) and Foynes, a seaplane base, trans-Atlantic services are operated.

**HISTORY.** The Anglo-Irish Treaty, signed on Dec. 6, 1921 (see Ireland), ratified by the parliament of the United Kingdom on Dec. 16, and by the elected members of the parliament (dail) of Southern Ireland on Jan. 15, 1922, brought a new dominion into being. This new state was the product of a compromise between the policy of the British government, defined by Lloyd George as that of ascertaining "how the association of Ireland with the community of nations known as the British Empire can best be reconciled with Irish national aspirations," and that of the Irish nationalist-republican leaders, who maintained, in De Valera's words, that "Ireland's right to choose the path she shall take to realize her own destiny must be accepted as indefeasible. . . ." The compromise was reached because both sides were determined to put an end to the internecine warfare which had ravaged Ireland; but for both it represented

a very considerable concession. Churchill, who was one of the British delegates at the conference, later described the negotiations and the treaty which emerged from them as "one of the most questionable and hazardous experiments upon which a great empire in the plenitude of its power has ever embarked." In Ireland the treaty, welcomed since it brought hostilities to an end, came to be regarded as a concession extracted by force from a war-weary oppressor. These contrasted interpretations of the document which brought the Irish Free State into being had important consequences for the future of Anglo-Irish relations.

#### Irish Free State Established

The underlying principle of the settlement of 1921 was the grant of dominion status to the Irish Free State. No precise definition of dominion status was embodied in the treaty, but it was therein provided that the new state was to have the same status in the British commonwealth of nations "as the dominion of Canada, the commonwealth of Australia, the dominion of New Zealand, and the union of South Africa with a parliament having powers to make laws for peace, order, and good government and an executive responsible to that parliament. . . ." To allay Irish misgiving, very particular reference was made to the dominion of Canada, as the senior dominion, and the practice and constitutional relationship between Britain and Canada were the pattern to be followed in relations between Britain and Ireland. This was a very considerable safeguard since, as Lloyd George said, any attempt "to encroach" upon the rights of the Irish Free State would make the overseas dominions each feel that "its own position is put in jeopardy."

There were two clauses in the treaty, one dictated by considerations of politics, the other by geographical factors, over which controversy arose. The first was article 4, which provided that an oath was to be taken by all members of the Free State parliament swearing "true faith and allegiance to the constitution of the Irish Free State as by law established" and faithfulness "to H.M. King George V . . . in virtue of the common citizenship of Ireland with Great Britain and her adherence to and membership of the group of nations forming the British Commonwealth." The other, art. 7, based on the con-

ception of the strategic unity of the British Isles, allowed for the partial maintenance of British naval control over Irish coastal defences. In time of peace, the Irish Free State agreed to afford to the British forces specific harbour and other facilities, whilst in time of war or strained relations these facilities might be extended to anything required for defence purposes by the United Kingdom government. It was in accordance with the terms of this article that the Royal Navy used the treaty ports of Cobh, Berehaven, and Lough Swilly until the agreement of 1938. These two provisions were the principal target for republican critics of the treaty. Their positive solution as defined by De Valera was not dominion status and all that it implied, but the external association "of the Irish republic with the British Commonwealth."

The negotiations with Britain, in the first instance conducted by De Valera, had been concluded by the Irish delegation which went to London. Arthur Griffith and Michael Collins were its leaders. When the terms of the settlement they had negotiated were published on Dec. 6, 1921, De Valera announced his opposition. In the dail, opinion was evenly divided and after a protracted debate the treaty was approved by a majority of only seven; 64 votes being cast in favour, 57 against. De Valera thereupon resigned and Arthur Griffith was elected president in his place by the narrow margin of two votes.

#### Division in Sinn Féin

While there is no doubt that opinion in a country weary of warfare was more favourable to the treaty than opinion in the dail, there was no disguising the reality of the gulf that divided the ideological republican wing of the hitherto united Sinn Féin party from the "free staters" led by Collins and Griffith. The former, under the leadership of De Valera, maintained that the republic proclaimed in 1916, ratified by the first dail in 1919, was the only form of government that could be accepted; that any compromise on this supreme issue was a dishonourable betrayal of national rights. To this doctrinaire denunciation of all compromise, Griffith and Collins replied by pointing to the great constitutional advance which the treaty recorded and the solid benefits which it conferred on Ireland. But the issue thus raised divided the Irish people too deeply to be

easily settled by argument, even though determined efforts were made to paper over the cracks. The most important of these efforts was the agreement between the two opposing parties to put forward a joint panel of candidates at the general election to be held on the treaty issue with a view to reproducing the distribution of strength in the existing dail. The device failed to achieve its object, because Labour and other smaller parties decided to put forward candidates. Of these non-panel candidates, 34 were elected, all in favour of the treaty. The defeat of the republicans was thereby made as evident as the fact that they were not prepared to accept the verdict of the polls as final. The majority, in De Valera's view, had "no right to do wrong."

#### Outbreak of Civil War

Civil war was the sequel. Its outbreak may be dated from June 28, 1922, when the leaders of the dissident forces of the old I.R.A., who refused to obey the orders of the provisional government of the Irish Free State, were besieged in the Four Courts. The fighting in Dublin was not prolonged; but despite defeat in the capital, the "flying columns" of the irregulars sustained a protracted resistance in the provinces, particularly in the south and west. On March 23, 1923, De Valera and Frank Aiken, the republican chief of staff, called on their followers to cease hostilities; but more than a year was to elapse before order was fully restored. Though the casualties on either side were not heavy, the bitterness and the ruthlessness associated with civil wars were all too evident. Of the former Sinn Féin leaders, Arthur Griffith died on Aug. 12, 1922, his spirit broken by the coming of "fratricidal strife"; and Michael Collins was killed in an ambush in co. Cork on Aug. 22 of the same year. Many of the principal republican leaders, including Erskine Childers, were executed either by order of the provisional government or later by that of the government of the Irish Free State.

Plans for the future government of the new state were not wholly interrupted by the civil war. Shortly after the ratification of the treaty by the Irish parliament, a committee under the chairmanship of Michael Collins was appointed to prepare a draft constitution. Its conclusions were embodied in a constitution bill submitted to the constituent assembly

by W. T. Cosgrave, who succeeded Arthur Griffith as president on Sept. 18, 1922. Considerably amended, this constitution was brought into operation on Dec. 6 of the same year by proclamation. Its provisions determined the form of government of the Irish Free State until 1937.

#### Terms of the 1922 Constitution

The constitution established a legislature of two houses: the senate and the dáil. The former, elected first by the suffrage of all citizens over 30, and later by indirect election, had a membership of 60. The dáil, whose membership is determined on a population basis, had in the first instance 153 members, as against 138 in 1944. The cabinet, termed the executive council, was made responsible to the dáil. The governor general acted as the representative of the crown. The remaining provisions of the constitution conformed to the accepted pattern of advanced representative government with certain experimental innovations which, *inter alia*, allowed for the appointment of "extern" ministers and the use of the referendum. These innovations for the most part proved of little practical value.

It was laid down that the provisions of the constitution should be construed with reference to the treaty. If any provision conflicted with the treaty, it was for that reason declared to be "absolutely void and inoperative." This "repugnancy clause," as it was termed, which accorded the highest legal authority to the treaty, helped to keep it very much in the arena of party politics. Partly to offset unique legal status thus vested in the treaty, national sovereignty was reasserted in the provision "that all lawful authority comes from God to the people," and at the same time, in order to underline the continuity of the dáil's authority from the revolutionary assembly of 1919, the first dáil elected under the constitution was called the third dáil.

The constitution enacted, the principal task confronting the government was the restoration of public order and the creation of a settled administrative, social, and economic system. Hitherto Irishmen's experience in the art of self-government had been confined largely to the field of local politics. The lasting achievement that stands to Cosgrave's credit is that with patience and inflexible purpose he laid firm foundations upon which a democratic system

of government was established. To assist him in his task he selected as colleagues on the executive council young men, mostly unknown at the time of their accession to office, but in the course of years to acquire a high and well-deserved reputation as efficient and enlightened administrators. Among them were Kevin O'Higgins, the vice-president of the council, Patrick Hogan, minister for Agriculture, Ernest Blythe, minister for Finance, P. McGilligan, minister for Industry and Commerce from 1924. T. M. Healy, K.C., was appointed the first governor general.

The Irish Free State comprised 26 out of the 32 counties of Ireland. This was in effect a recognition of the status quo, because the Government of Ireland Act, 1920, had divided the country into its two parts. Under the terms of the treaty, Northern Ireland was given the power to opt out of the Irish Free State within a month of its ratification. This was duly done, but though the unity of Ireland remained for the moment an impracticable ideal cherished by "free staters" and republicans alike, the exact delimitation of the boundary remained in suspense. Art. 12 of the treaty had provided that, if Northern Ireland decided to remain outside the Free State, a boundary commission should be appointed "to determine in accordance with the wishes of the inhabitants, so far as may be compatible with economic and geographical considerations, the boundaries between Northern Ireland and the rest of Ireland."

#### Boundary Compromise

The boundary commission was appointed in due course in 1924, but before its conclusions were published the Free State representative, Professor Eoin MacNeill, resigned. It had been generally anticipated in Dublin that the loosely worded directive embodied in art. 12 would permit of adjustments of the boundary in favour of the Irish Free State. When it was understood that these hopes were not to be fulfilled, passions were aroused and Professor MacNeill followed his resignation from the commission by resigning from the executive council as well. Momentarily the position of the government was made very difficult. Ultimately, however, a compromise solution was reached in London by which the boundary remained unchanged, but the Irish Free State's liability

for a fair share of the public debt of the United Kingdom as it stood in 1921 was cancelled. The agreement was carried only after being subjected to bitter criticism in the dáil.

After the election of 1923 the Cosgrave party, known as Cumann na nGaedhael, remained in a strong position; but this was partly due to the abstention of De Valera's followers, 39 of whom were elected, but all of whom declined to take their seats. Their abstention was due to the oath to which reference has already been made and to which all members of the dáil had to subscribe before taking their seats. The opposition in the chamber was therefore provided principally by the Labour party and in lesser degree by the Farmers and Independents, all of whom were pro-treaty. In the senate, the government was likewise in a strong position, the more so in that the provisional arrangements for its composition allowed for a high proportion of nominated members. It was by using this power of nomination in their favour that the government was able to some extent to reconcile ex-unionists to the new regime.

#### Cosgrave's Administration

The early days of the Cosgrave government were devoted to retrenchment and reform. The financial position required to be stabilised, and this involved heavy taxation and some reduction in social services, the most notable of which was the decrease in old age pensions from 10s. to 9s. in 1924. These measures did not enhance the popularity of the government with the electorate; but they made possible a more forward policy after 1925. In the early years, too, the administrative reorganization alone was a formidable task, and to it was added the thorough reconstitution of the judicial system.

The government had inherited from the Sinn Féin movement a not uncritical faith in the doctrines of economic nationalism, one aim of which was to be independent of English manufactures. The growth of industry was encouraged where necessary by the imposition of tariffs. The budget of 1924 imposed, *inter alia*, duties on sugar, confectionery, boots and shoes, and on glass bottles. It was a tentative experiment in protection which was judged to have been sufficiently justified by its results to be extended in 1925. Duties were then imposed upon clothing and

blankets, bedsteads and wooden furniture. The amount of the duty varied from 15 p.c. to 33½ p.c., and succeeding years were to see a gradual extension of these protective tariffs until a wide range of manufactured articles was covered by them. The other side of the picture was to be found in the positive encouragement given to local industry by the payment of subsidies and the provision of cheap credit facilities.

The goal of economic self-sufficiency was a distant one, but certain notable steps were taken to bring it nearer. Two state-aided enterprises on which the government embarked had ultimately a far-reaching effect upon Eire's economy. The first, and the more modest, was the subsidised sugar-beet factory established at Carlow. This proved outstandingly successful and was to be the forerunner of an extensive sugar-beet industry which, by 1940, was to make Eire virtually self-supporting so far as sugar was concerned. The other, and more important, enterprise was the Shannon hydro-electric scheme, designed to provide the Irish manufacturer with a cheap and convenient source of power. This great enterprise, carried out by Siemens-Schuckert, harnessed the water power of the Shannon to the material benefit of industry and of the community in general.

#### Agricultural Reforms

While the Cosgrave government fostered the growth of industry, its principal concern was agriculture, always the foundation of Ireland's economy. Many reforms directed to its improvement were carried through under the active direction of Patrick Hogan. Measures were taken to ensure the more efficient marketing of Irish products overseas; to improve the quality of her livestock by better breeding; and to ensure that agricultural land was used to better advantage. Many of the reforms were expressly designed to help the small farmer. The Land Act of 1923, an important measure, completed land purchase and aimed at relieving congestion. Under its provisions wide powers were given to the land commission to acquire untenanted land for this last purpose.

The general election of June, 1927, was the first held under normal conditions. Despite its solid administrative achievement, the government lost considerable ground. Cumann na nGaedhael lost 11 seats, its strength in the

dáil being reduced from 57 to 46. The smaller parties gained many seats, Labour returning 22 members and the Farmers, National League, and Independents 33 between them. So too did Fianna Fáil, though its representatives still declined to take seats. Cosgrave, however, despite this decline in his party's strength, was alone in a position to form a new administration.

#### Measures Against Extremists

A month after the election Kevin O'Higgins, vice-president of the executive council, was assassinated outside Dublin. The government, taking the view that the assassination constituted an attack upon the stability and a challenge to the authority of the state and holding the more extreme republicans responsible for encouraging acts of violence, responded by introducing into the dáil a public safety act which gave wide powers to the executive. This was followed by the announcement of legislation prescribing that all candidates at future elections must take an oath stating their willingness to enter the dáil by subscribing to the oath of allegiance. This threat compelled De Valera and his followers to take a drastic decision, and rather than face permanent exclusion they decided to subscribe to the oath, though they maintained that in the circumstances it was no more than "an empty formula." On August 16, on a motion of "no confidence," the government was saved only by the disappearance of a National League deputy at the last moment, which allowed the speaker to give his casting vote on the ministerial side. A general election followed, and when the sixth dáil assembled on Oct. 11, 1927, Cosgrave, who formed a new administration, had 61 followers to De Valera's 57. The smaller parties were greatly reduced in strength, Labour returning 13 members, and the Farmers, National League, and Independents only 17 between them.

In the ten years that elapsed between the treaty and the fall of the Cosgrave government in 1931, the whole tendency in intra-imperial relations was towards securing in law and in practice the complete autonomy of the British dominions. To this development, the Irish Free State materially contributed. The policy of its government, with its emphasis on the national status of the Irish Free State, was designed to secure

independence within the commonwealth. The advance recorded by the imperial conference in 1926 gave satisfaction, but in the opinion of the Irish government it did not go far enough. Its continued anxiety was to ensure that the principles of equality appropriate to status should also be extended to function. "Our purpose," said McGilligan, the minister for External Affairs in 1926, "is to uproot from the whole system of this state the British government" and in substitution for that "to accept the British monarch." In furtherance of this aim, opportunities were taken to emphasise the independence of the Irish Free State in the field of foreign policy by playing an active part in the councils of the League of Nations, with which the treaty had been registered in 1924, and to appoint diplomatic representatives in foreign capitals.

The Statute of Westminster, with its implicit recognition of the autonomy of the Irish Free State, marked the opening of a new phase in Anglo-Irish relations. Speaking of its effect McGilligan remarked in July, 1931, that "by four years of assiduous concentrated collaboration the whole legal machinery of the old colonial empire had been taken asunder." Certainly the constitutional progress effected during this first decade of the Free State's existence did much to belie the fears of those republican opponents of the treaty who had felt that the idea of constitutional evolution embodied in the conception of dominion status had no reality for Ireland.

#### De Valera's Rise to Power

Internally, the last years of the Cosgrave regime saw a mounting tide of discontent, accentuated by the effects of the world depression and by a recrudescence of violence. The I.R.A. re-emerged and presented a challenge to constituted authority which could not be ignored. The government thereupon had recourse to security measures which were bound to reflect upon its popularity in the country to a degree that it could ill afford. It was, therefore, no surprise when, after ten years in office, the Cosgrave party suffered a decisive reverse at the polls in the election of Feb., 1932. Fianna Fáil, once more notably increasing its strength, secured 72 seats, and De Valera's election to office duly followed. O'Kelly became vice-president of the executive council, Frank Aiken

minister for Defence, Seán Lemass minister for Industry and Commerce, and Dr. James Ryan minister for Agriculture.

De Valera's first action on accession to office was the introduction of a bill to remove the oath from the constitution. In a communication dated March 22, 1932, to J. H. Thomas, then secretary of state for Dominion Affairs, he stated that the oath was "an intolerable burden," "a relic of medievalism" imposed from outside "under the threat of immediate and terrible war." In this protest there is no doubt he had strong support in the country, even outside his own party. It was arguable, moreover, that the recent constitutional advances which had received legal endorsement in the Statute of Westminster conferred upon the Free State constitutional powers not contemplated by the signatories of the treaty, and had modified the status therein defined to the extent of according full autonomy to the self-governing dominions. The issue was not considered carefully in this light, because De Valera made it clear that it was his intention to remove all the recognized symbols of dominion status by the unilateral denunciation of those provisions of the treaty in which they were embodied. In fulfilment of this policy the right of appeal to the privy council was abolished; the occasion of a dispute with the governor general was found in order to deprive the office on his resignation both of authority and dignity; and one by one most of the remaining links with the British Commonwealth were severed.

In 1934 a citizenship bill was introduced in the *dáil* giving clear evidence of the determination to emphasise the distinctive national status of Ireland, though not necessarily to dissociate her finally from the commonwealth. In the debate on the bill De Valera, while admitting that "we are not able to tell the British that they must cease calling our citizens British subjects," stated that when the bill became law "it would be an impertinence if the British were to claim as citizens of their country people who are obviously citizens of another country." And he added "not a single line or comma of this bill would be altered if a republic were declared for the whole of Ireland tomorrow." But De Valera indicated implicitly, if not for political reasons explicitly, his reluctance to sever all

connexion with the commonwealth and reiterated his personal predilection for the solution which in 1921 he had termed "external association" under which a national, independent republic would for certain purposes be associated with a commonwealth, the symbol of whose unity is the crown.

The changes in the constitutional relationship between the two countries were hastened by the abdication crisis in 1936. The opportunity was taken to eliminate the "royal assent" to bills from legislative procedure, to abolish the office of governor general; and to pass an External Relations Act recognizing the association of the Free State with the British commonwealth, and authorising the king, as head of the British commonwealth, to act in the matter of diplomatic and consular representatives, on the advice of the executive council. Internally the consequences of these changes produced a curious situation, since parallel with the external changes the decision had been taken to abolish the senate, still a stronghold of Cosgrave and even of Unionist influence. This meant in effect that the legislature of the Irish Free State, which had consisted of the king and two houses, now consisted of one house. It was clear that the time had come when a new constitutional structure had

of the Fianna Fáil party, "go for ever."

The table printed below shows, for example, that in 1925 no less than 97 p.c. of the Irish Free State's total exports went to Britain. A high proportion of this consisted of livestock exports. That this export was profitable to Irish farmers was not in question, but the Fianna Fáil party maintained that it was unfortunate in its social consequences, since cattle rearing provided little employment, and was politically undesirable, since it tied the country economically to Britain. The positive aim was to provide a more balanced economy by increasing the area of arable land and by fostering on a much greater scale than hitherto decentralised industry.

De Valera widened the basis of the political dispute arising out of his unilateral denunciation of the provisions of the treaty by introducing an economic issue. This was created by the decision not to pay the land annuities. These annuities were half-yearly payments collected from tenant farmers and due to investors through the United Kingdom government for money advanced to enable Irish farmers under a succession of Land Acts to buy out their land. The payment of these sums had been endorsed by two agreements signed by Cosgrave's government

STATISTICAL ABSTRACT SHOWING THE DIRECTION OF EIRE'S EXPORT TRADE OVER A PERIOD OF YEARS

Year	Total	Foreign Countries		British Empire		United Kingdom	
	£1,000	£1,000	Per cent	£1,000	Per cent	£1,000	Per cent
1925	43,374	921	2.1	42,453	97.9	42,302	97.5
1929	46,225	2,749	6.0	43,476	94.0	42,886	92.8
1931	35,546	1,117	3.1	34,429	96.9	34,214	96.3
1935	19,515	1,341	6.9	18,274	93.1	17,991	91.8
1938	24,240	1,545	6.2	22,795	93.8	22,443	92.6

to be devised to replace that enacted in 1922.

Irish Republican sentiment had always regarded economic self-sufficiency as the counterpart of political independence. De Valera on acceding to office in 1932 made clear his intention to readjust Ireland's economy to bring it much nearer to that ideal. That meant on the one hand a departure from the *laissez-faire* economics which had for the most part guided Cosgrave's administration and on the other an attempt to end Ireland's dependence on the British market. The British market "must go" and, to quote an election slogan

in 1923 and 1926 respectively, but neither was submitted to the *dáil* for ratification. *Inter alia* the Fianna Fáil government maintained that these agreements had no validity and that on grounds both of law and equity the payments were unjustifiable. The dispute was a highly technical one, and the prospect of early settlement was slight because the two parties to it could not agree on the composition of a tribunal to which it might be referred.

The refusal to pay the annuities provoked much resentment in London and retaliatory duties were imposed on Irish agricultural

products coming into Britain from which a sum equivalent to the annuities was to be collected. The duties were severe. On Irish cattle, to take one example, the duties varied from £1 5s. to £6 per head according to the age and type of beast imported. Great hardships were imposed on Irish farmers, even though every encouragement was given to them to turn over in part to tillage.

De Valera's government also attempted by means of subsidies and bounties to secure alternative markets overseas, but, as seen from the table in the facing p., these attempts achieved little success. In 1929 Ireland exported 6 p.c. of her products to non-commonwealth countries; by 1936, after four years of the "economic war," this figure had been raised only to 7.2 p.c. The value of the U.K. market to Ireland was notably reaffirmed.

The turnover from pasture to tillage achieved, on the other hand, very considerable success. In 1934 the Irish Free State grew only 10 p.c. of the wheat she consumed. By 1936 this figure had been increased to 33½ p.c., whilst in the war years Eire became virtually self-supporting in wheat. The comparative acreage figures are equally striking. In 1931 the acreage under wheat was 20,848; by 1940 it had reached 305,248; in 1945 with compulsory tillage enforced it had reached 666,300 acres. In the same way the sugar-beet industry was fostered and expanded until Eire became almost wholly self-supporting in sugar. To the sugar factory already established at Carlow were added new factories at Thurles, Tuam, and Mallow under government auspices.

The imposition of duties on Irish agricultural produce by Britain was countered by the imposition of heavier duties on imported manufactured products from Britain. These ranged from 40 p.c. to 75 p.c. They were at once retaliatory and protective. Behind the formidable barrier which they provided native industry was encouraged and every inducement was given to ensure that it was decentralised so as to provide employment not only in the large cities, but also in the smaller country towns. The minister for Industry and Commerce, Seán Lemass, played a notable part in directing this industrial revival. As a result imports were in fact sharply reduced from £61,000,000 in 1929 to £40,000,000 in 1936. The Government moreover embarked on a

programme of expansion in the social services and in a timely and much needed rehousing campaign both in urban areas and in rural districts where housing conditions left much to be desired.

The economic war imposed great hardships on Ireland. De Valera, to secure a new mandate

#### STATISTICAL ABSTRACT SHOWING THE DIRECTION OF EIRE'S IMPORT TRADE OVER A PERIOD OF YEARS

Year	Total	Foreign Countries		British Empire		United Kingdom	
	£1,000	£1,000	Per cent	£1,000	Per cent	£1,000	Per cent
1925	62,950	8,978	14.3	53,972	85.7	51,034	81.2
1929	61,316	12,230	19.9	49,086	80.1	47,894	78.1
1931	50,461	8,236	16.3	42,226	83.7	40,772	80.8
1935	37,348	8,224	22.2	29,124	77.8	27,046	72.4
1938	41,413	16,130	40.1	25,283	59.9	20,893	50.4

for his policy and popular support for his attitude in the "economic war," went to the polls in 1933 where he increased his strength to 77—a clear majority in the dail. In the 1937 election his position was substantially maintained. The full rigour of the economic reprisals was modified by the Coal-Cattle Pact of February, 1936, which was renewed in February, 1937. From 1932 De Valera's reputation at home grew. His outspoken contributions to debates at the League of Nations were welcomed in wider fields. The principal opposition party, led by Cosgrave, fell into a steady decline. Their association with General O'Duffy's Blueshirts in the early thirties was a damaging legacy and they lacked a positive, popular policy to counter De Valera's nationalist programme.

On June 14, 1937, the new constitution sponsored by De Valera was approved by the dail and submitted to a referendum on July 1 whose verdict was favourable, though not by a very large majority, 686,042 votes being cast in favour; 528,362 against. The constitution came into force on Dec. 29, 1937. It declared Ireland to be a sovereign, independent, democratic state. It reaffirmed the right of the Irish people to choose its own form of government and to determine its relations with other states. The constitution applied to the whole of Ireland but it allowed that "pending the reintegration of national territory" its jurisdiction should have the same area as the Irish Free State. The name of the state is Eire, in the English language Ireland.

The constitution provides for the election of a president (*An Uachtarán*) as head of the state by universal adult suffrage, the president to hold office for seven years. The *Oireachtas* or parliament consists of the president and two houses. The restored senate consists of 60 members, eleven nominated by the prime minister (*An Taoiseach*), six by the universities, and the re-

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maining 43 on a vocational basis. The position and powers of the dail remained substantially unaffected. The prime minister and his cabinet are responsible to it.

The constitution also lays down certain principles of social policy for the guidance of the legislature and certain fundamental rights to be enjoyed by every citizen. It recognizes the family as the "natural, primary and fundamental" unit in society, and it pledges itself to guard with special care the institution of marriage. The special position of the R.C. church as the guardian of the faith professed by the great majority of the people is recognized.

The 1937 constitution did not define the state as monarchy or republic. The crown was not mentioned, though provision was made obliquely for the use of the royal signature to letters of credence to foreign powers. In a statement issued after the promulgation of the new constitution, the government of the United Kingdom declared with the assent of the overseas dominions that it would continue to regard Eire as a member of the commonwealth and that H.M. government would regard the new constitution "as not effecting a fundamental alteration in the position of the Irish Free State."

The first president, Dr. Douglas Hyde, held office from 1938 to 1945, when Seán T. O'Ceallaigh (Seán T. O'Kelly) was elected to succeed him.

The economic war was ended in 1938 by a compromise solution under which Eire paid a lump capital sum of £10,000,000 as a final settlement of all outstanding claims by either government up to



the time of the agreement. The U.K. government as part of a wider policy of settling all outstanding differences with Eire agreed to hand back the ports, Cobh, Berehaven, and Lough Swilly, held under the treaty of 1921. In little more than a year war engulfed Europe.

When Germany invaded Poland, Eire, as had been expected, announced her intention of remaining neutral in the conflict. This decision was endorsed by the vast majority of the Irish people. De Valera consistently declared that one governing reason for Eire's neutrality was the need to preserve internal unity. Any other course might have led to civil war, all the more so in view of the revived terrorist activities of the I.R.A. in 1938-9. The policy of neutrality was reinforced by the imposition of a rigid censorship designed to eliminate any possibility of public appeals to sentiment or to reason to engage in the conflict on either side.

#### Eire's Policy of Neutrality

In 1941 a few scattered bombs were dropped by German aircraft in Dublin and the provinces, and in the latter year heavy raids on Belfast aroused practical sympathy south of the border. Every effort was made, despite lack of equipment and aircraft, to have the country's defences manned so as to be in a position to withstand aggression. The regular army was reinforced by the creation of a volunteer local security force to which all classes and all sections of opinion rallied. This was an indication of the fact that for the first time since the treaty the principal Irish parties were in complete agreement about the policy which the country should pursue. It is very significant that in neither of the two wartime general elections, held in 1943 and 1944 respectively, was neutrality an issue. The people's confidence in De Valera was renewed because it was generally believed that his experience and his diplomatic skill would serve the country best in the carrying out of its chosen policy during these critical years.

While neutrality remained in effect unchallenged as a policy—except by J. M. Dillon—many thousands of Eire's citizens joined the British forces and served in them with gallantry. Thousands more went to work in Britain's war factories. This great wartime exodus of young men and women undoubtedly had a healthy influence in improving Anglo-Irish rela-

tions, despite the wartime strains to which they were subjected.

The isolation from the western world which neutrality involved heightened Eire's sense of economic and political self-dependence. On the economic side, particularly after the Japanese entry into the war, imports of many raw materials and foodstuffs were virtually cut off. The resulting difficulties were enhanced by the acute fuel shortage. Trains were compelled to run on wood and turf at the most stringent period, and for over four years there was only sufficient petrol to maintain essential services. On the other hand, thanks in no small degree to the steps that had been taken to bring about a better balanced agricultural system, Eire remained throughout a country of comparative plenty, though there was a lack of imported foods; the tea ration, for instance, was for several years  $\frac{1}{2}$  oz. per week. On the political side, neutrality, adopted as a policy, came to be regarded as a symbolic assertion of national sovereignty.

When the U.S.A. entered the war, De Valera described Eire's position as that of "a friendly neutral," but he added, "from the moment war began there was for us only one policy possible—neutrality. Our circumstances, our history, the incompleteness of our freedom, from the partition of our country, made any other policy impracticable. Any other policy would have divided our people, and for a divided nation to fling itself into war would have been suicide." When American troops landed in Northern Ireland in 1942, De Valera protested on the ground that the partition was "aggression which his government would denounce, no matter what troops occupied the six counties."

#### Axis Diplomats in Dublin

Throughout the war, the diplomatic representatives of the Axis powers remained in Dublin. Misgivings were entertained in many quarters about the facilities for espionage enjoyed in a neutral capital so well situated for this purpose. In February, 1944, the American government presented a note asking for the removal of these diplomats on the grounds that in general "the neutrality of the Irish government operated and in fact continued to operate in favour of the Axis powers," and in particular that the Axis legations were either engaged or were able to engage in large-scale espionage for their respective governments.

The reply to this note denied the general charge and rejected the particular request. "It is not perhaps known to the American government," ran a sentence in De Valera's reply, "that the feelings of the Irish people towards Britain have undergone a considerable change precisely because Britain has not attempted to violate our neutrality." Partition, in fact, remained the one outstanding question between the two countries.

#### Favourable Post-War Position

The immediate post-war years found Eire in a strong creditor position. Her accumulated sterling balances amounted in 1946 to some £400 million. In comparison with the war-torn countries of the European continent, Eire's position was indeed fortunate. For later events in the history of the country, including the electoral defeat of De Valera and the passing of the Republic of Ireland Act, 1948, see in N.V. pages at the end of this Encyclopedia.

#### LANGUAGE AND LITERATURE.

The Irish language is taught in all schools and a knowledge of it is essential in the civil service and in most public offices. The great majority of the people, however, remain English speaking.

Literature in English continued to flourish, but the high tide of the great literary movement of the early twentieth century had passed. The romantic nationalism of the earlier writers was replaced by a realism that sometimes bore the impress of disillusion. Of this new sentiment, Seán O'Casey was perhaps the outstanding interpreter in the field of drama, and his plays of Dublin life, of which *The Shadow of the Gunman* is perhaps most familiar, long moved audiences at the Abbey Theatre to laughter and to tears. Lennox Robinson, T. C. Murray, and Denis Johnston all made notable contributions to drama, Johnston's *The Moon in the Yellow River* making a deep impression.

Realism also profoundly influenced the novel in Eire, Liam O'Flaherty's *The Informer* being an outstanding contribution by this new school. Daniel Corkery and Frank O'Connor made reputations as writers of short stories, the latter's *Bones of Contention* containing masterly sketches of Irish life and character. Seán O'Faolain achieved note both as a novelist and as a writer of historical biography. Elizabeth Bowen, an Anglo-Irish novelist, showed her pre-eminence as a short-

story writer in, e.g., *The Demon Lover*. Lord Dunsany's work both as dramatist and story-teller stands outside the main stream of Irish literature. Yeats and Moore, Joyce and Shaw, were all Irishmen, but their writings belong not to Irish but to world literature.

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**Eisenach.** German town in the state of Thuringia, until 1918 second residence of the grand-dukes of Saxe-Weimar-Eisenach. It stands in the valley of the Hörsel, 32 m. by rly. W. of Erfurt, and was internationally known mainly by the neighbouring Wartburg (q.v.) with its legends and history. Of its seven monasteries in the Middle Ages, one is partly preserved, together with the Romanesque church of S. Nicholas (12th century) and the church of S. Anne (13th cent.). The market church, former palace (1742-45), and town hall (1508, rebuilt 1638) are other remarkable buildings which survived the Second Great War. J. S. Bach was born and Luther went to school in Eisenach, which was renowned for its schools, theatre, museums, and spa for rheumatic diseases. Founded in the 12th century by the Thuringian landgraves, it was a capital of a separate duchy from 1672 to 1741, then united with Weimar until 1918. It fell to American infantry in the Second Great War, April 6, 1945. Pop., pre-war, 44,695.

**Eisenberg.** Town of Germany, in Saxe-Altenburg. It is 24 m. W. of Altenburg, and is connected by rly. with Leipzig. Old buildings include a castle, churches, schools, etc., and there are porcelain and piano factories. Pop. 11,900.

**Eisenhower, Mount.** Peak of the Canadian Rockies. Formerly called Castle Mt., it was renamed in 1946 in honour of Gen. D. D. Eisenhower, supreme commander of the Allied expeditionary forces in N.W. Europe. The mountain is near Banff, in the S.W. of Alberta. Alt. 9,390 ft.

## EISENHOWER: SUPREME COMMANDER

Lieut.-Gen. Sir Gifford Le Quesne Martel, K.C.B., D.S.O.

*Eisenhower's ability to secure the loyalty and cooperation of the men of varied nationality and personality who served under him during the Second Great War was a vital factor in the success of his campaigns, described under the headings Europe, Liberation of; North Africa Campaigns*

Dwight David Eisenhower was born on Oct. 14, 1890, at Denison, Texas, U.S.A., the 3rd son of David J. Eisenhower and Ida Elizabeth Stover. His family moved shortly afterwards to Abilene, Kansas, where he received his early education. In 1912 he went to the U.S. military academy at West Point, graduating 1915. He did not take a leading position in his academic studies at school or at the academy, though he passed his tests satisfactorily; at both he excelled in sport and games.

During 1915-1917 he served in the infantry as a company officer, and as an instructor in army service schools at Fort Leavenworth. In 1918 he organized and commanded Camp Colt, a training centre for tank corps troops. He remained with the tank corps until 1922; then became executive officer of Camp Gaillard, Panama, and subsequently served in various posts in many parts of the U.S. In 1926 he graduated at the command and general staff school, Fort Leavenworth, Kansas, being placed first in the list. Next year, with the rank of major, he was appointed to the American battle monuments commission in Paris.

During 1929-33 he was assistant executive in the office of the assistant secretary of war, graduating meanwhile from the army industrial college, and drafting the war department's plans for indus-

trial mobilisation in case of war. Until 1935 he served in the office of the chief of staff; then until 1940 he became assistant military adviser (under Gen. MacArthur, q.v.) to the commonwealth of the Philippines. On returning to the U.S.A. Eisenhower served, in quick succession, as chief of staff to the 3rd division, the 9th corps, and the 3rd army, taking in the last named post a prominent part in the 1941 manoeuvres in Louisiana—largest peace-time military exercise ever held in the U.S.A. By now a brig.-gen., he went to Washington as assistant chief of staff in charge of the operations division, war department general staff, under Gen. Marshall (q.v.), until in June, 1942, now a maj.-gen., he was ordered to England, as commander of U.S. forces in the European theatre of operations (a new post), with instructions to begin preparations for U.S. participation in a cross-Channel attack against "Fortress Europe." His promotion to lieut.-gen. followed.

Shortly after his arrival in England, he was ordered to take command of the Allied attack on Vichy-controlled French N. Africa. The Vichy and U.S. governments were still in diplomatic relations; and since information furnished by the American chargé d'affaires in Algiers, Robert Murphy, led the Allied leaders to believe that whereas a British landing force might encounter opposition the Americans would be welcomed, it was decided that the initial landings should be made by U.S. forces only, a British force landing later, with General Eisenhower as c.-in-c. of the whole.

Eisenhower made his own attitude towards his command clear by stating: "This is an Allied campaign . . . There will be neither praise nor blame for the British as British or the Americans as Americans. We are in this together as allies. We will fight it shoulder to shoulder."

The date set for the invasion was Nov. 8, 1942. The day before, Eisenhower broadcast two messages, also distributed by air, to Frenchmen in N. Africa, emphasising that his forces came as friends to make war against France's enemies, and that the



*Dwight D. Eisenhower*

sovereignty of France over French territory remained unaffected. Giraud (*q.v.*), describing himself as c.-in-c. of French forces in N. Africa, broadcast an appeal for support from his fellow countrymen; while De Gaulle (*q.v.*) broadcast from London, urging the French in N. Africa to rise and help France's allies. Satisfactory landings—the largest operation of the kind ever attempted to that date—were effected in Algeria, though not without serious opposition, brought to an end on Nov. 11 when Admiral Darlan (*q.v.*), c.-in-c. French (Vichy) Forces, who happened to be in N. Africa, decided to throw in his lot with the Allies and ordered the French to cease fire.

#### Appointed C.-in-C. North Africa

While the Allied troops under their field commanders advanced against increasing German opposition into Tunisia, Eisenhower found himself involved in a net of French political intrigue in Algiers, somewhat simplified by the assassination of Darlan, whom no one trusted, on Dec. 24, 1942. President Roosevelt and Winston Churchill, meeting in Casablanca in Jan., 1943, eased the political situation by bringing De Gaulle and Giraud into personal contact there; and in consultation with the combined chiefs of staff settled the order of military precedence to include the 8th army, then advancing towards Tunisia. This decision, made public on Feb. 6, created a N. Africa operational theatre under the command of Eisenhower, with Gen. Alexander as his deputy. Eisenhower's promotion to gen. followed in a few days. Churchill, who spent Feb. 5 and 6 with him at Algiers, told the house of commons on Feb. 11, "I regard him as one of the finest men I have ever met."

The course of the fighting in Tunisia is described under North Africa Campaigns. It finished in May, and preparations were immediately begun for a landing in Sicily (*q.v.*), conquest of which was carried through triumphantly under Eisenhower's command between July 10 and Aug. 17, 1943. The swiftness of this operation led to the downfall of Mussolini, and the surrender of Italy on Sept. 3, the day of the first Allied landings (again under Eisenhower's command) on the mainland of Europe near Reggio in Catania.

In Dec. Eisenhower was notified by the combined chiefs of staff that he had been appointed supreme commander of the British

and U.S. expeditionary forces organizing in the U.K. for the liberation of Europe. In a press interview at his G.H.Q., in N. Africa, he declared that his immediate job would be "to weld the directing team together in such a way that no real friction ever develops, that people trust each other, work in unison, and go into this thing with their full weight."

Eisenhower had proved not only his own ability to work with men of other nationalities and of varying temperaments, but also a rare capacity for getting them to work together, and he was to continue to demonstrate these gifts essential to the successful outcome of the Allied purpose.

The outline plan of Overlord, as the operation in which he was now engaged was called, had been approved at the Quebec conference in Aug., but when Eisenhower studied it early in Dec. he felt the initial assaulting forces proposed were of insufficient strength, and the front too narrow.

On his arrival in London on Jan. 15, 1944, he initiated discussions which led to an increase in the striking force from three to five divisions, and the extension of the beach-head area. His official appointment as Supreme Commander Allied Expeditionary Force dated from Feb. 14. His headquarters (known as SHAEF), located at first at Norfolk House, St. James's Sq., London, was moved at his desire, with the object of closer unification, to Bushey Park, near Kingston-on-Thames, in March.

#### His Irrevocable Decision

The date originally set for the invasion was May 1; but the insufficiency of assault craft for the larger striking force Eisenhower was using made postponement necessary, and the first week of June was chosen instead, Eisenhower setting June 5 as the first date, subject to last minute revision if the weather were unfavourable. The 6th and 7th were equally acceptable, but then the next date on which conditions of time and tide were suitable was June 19. June, 1944, brought the roughest weather experienced in the Channel in June for 20 years. The weather forecast on the morning of June 5 "contained a gleam of hope," says Eisenhower, for the following day. "At 04.00 hours on June 5 I took the final and irrevocable decision: the invasion of France would take place on the following day." The great-

est decision in military history had been made, and the victorious campaign (described under the heading Europe, Liberation of) was initiated.

After the departure of the German delegates from the surrender ceremony at Reims on May 7, 1945, Eisenhower said to the Allied commanders who had witnessed it: "This unconditional surrender has been achieved by team work. To every subordinate in this command of five million men who took part I owe a debt of gratitude which I can never repay." In the conclusion of his report on the operations in N.W. Europe he wrote, "The United States of America and Great Britain have worked, not merely as allies, but as one nation, pooling their resources of men and material alike . . . An allied experiment unprecedented in the history of the world has been carried out with decisive results." The overwhelming success of this gigantic experiment was the measure of Eisenhower's greatness of character and his wisdom.

#### Awards and Honours

Eisenhower was among the first three soldiers to be made general of the U.S. army when that five star rank was created Dec., 1944. He was chosen in March, 1945, to be c.-in-c. of the American forces of occupation in Germany, and chief U.S. representative in the Allied military government of Germany, posts he assumed after the surrender of the German forces in May, making his H.Q. at Frankfurt-on-Main. On June 11 he flew to England. Next day he drove through cheering crowds to the Guildhall to receive the freedom of the city of London, and the sword worn by Wellington at Waterloo, pending completion of a special sword of honour. The same day King George VI conferred on him, its first American recipient, the O.M. (he had been made hon. G.C.B. in 1943). On June 18 he was in Washington, where he addressed a joint session of Congress, describing the work of a commander as "a soul-killing task," and expressing his deep sense that war must not happen again. President Truman conferred on him the D.S.M. On an official visit to New York next day, to receive its freedom, he was given the biggest reception in the city's history, the crowd along his 37-mile drive being estimated at four million. The Order of Victory, highest Russian decoration, was conferred on him in June, and

when he visited Moscow in Aug. he was fêted by Stalin. Then he went to Belfast and Edinburgh receiving the freedom of both and, from the Scottish people, the life gift of a flat in Culzean Castle, Ayrshire.

On Nov. 20 Eisenhower who favoured a unified command for the U.S. armed forces, was appointed chief of staff of the U.S. army in succession to Gen. Marshall. In 1947 he accepted the presidency of Columbia University, New York taking up his duties in 1948. He refused suggestions from both the leading political parties that he might stand as presidential candidate in the 1948 elections. In 1949 he returned for a short time to the army as principal military adviser to the president and chairman of the joint meetings of the chiefs of staff. Eisenhower published *Crusade in Europe* 1948.

*Consult* Report by the Supreme Commander to the Combined Chiefs of Staff on the operations in Europe of the Allied Expeditionary Force, 1946, *Three Years with Eisenhower*, H. C. Butcher, 1946; Gen. Eisenhower, A. Hatch, 1946.

**Eisenstadt.** Town of Austria, in the prov. of Burgenland. It is 25 m. S.E. of Vienna, at the base of the Leitha Mts. It is famous for its magnificent palace long the residence of the Esterhazy family. Built in 1683, and enlarged in 1805, this has a fine library and beautiful gardens. The town has also a Franciscan monastery with a church in which members of the family of Esterhazy are buried. Haydn, conductor of the palace orchestra from 1760 to 1790 is also buried there.

**Eisenstein, SERGEI (1898-1948).** Russian stage and film producer. Born in Riga he became a scenic artist in 1920. His interest in psychology was evidenced in his methods of dramatic production; and when in 1924 he directed *The Strike* the first film in which masses of people took the place of single characters, he was recognized as a force in film technique. His later films, largely propagandist, included *The Battleship Potemkin*, *Ten Days that Shook the World*, *The General Line*, *Thunder Over Mexico*; and the historical dramas, *Alexander Nevsky* and *Ivan the Terrible*. Producer for the first Russian workers' theatre, he was awarded the Order of Lenin 1939, and the Stalin prize, 1941. He wrote *The Film Sense* 1943, and articles on films and film technique in periodicals. He died at Moscow Feb 10 1948.

**Eisleben.** Town of Germany, in Saxony. It is 20 miles W.N.W. of Halle, and is famous for its association with Luther, who was born and died here. The chief churches are those of S. Andrew and SS. Peter and Paul, both 15th century. There are separate town halls for the upper and lower towns. The memorials of Luther include the house in which he died, now a museum, a school which he founded, and a bronze statue. Eisleben has a school of mining, and is the trading centre for silver and copper mines. It was long on the lands of the counts of Mansfeld. In 1710 it passed to Saxony, and in 1815 became part of Prussia. It was in the Russian occupied zone of Germany after the Second Great War. Pop. approx. 25,000.

**Eisner, KURT (1867-1919).** The name adopted by Salomon Kosnowsky, German Socialist writer and politician. He was born in Berlin, May 14, 1867, of Galician-Jewish origin. Joining the Socialists he became associate editor of their organ, *Vorwärts*. When the First Great War broke out he joined his party in supporting it, but before the end he was one of the South German leaders who opposed the Kaiser. On the outbreak of the revolution of Nov., 1918, he himself took the position of prime minister and minister of foreign affairs, and later that of first president of the Bavarian republic. He sought to separate Bavaria from the rest of Germany, and to make separate peace arrangements with the Allies, but unavailing, and was assassinated in Munich, Feb. 21, 1919.

**Eistaler Spitze.** A peak in Czecho-Slovakia, 8,630 ft. It is one of the most difficult climbs in the High Tatra, but the views from the summit over the wide plain of Galicia to the N., and the Hungarian lowlands to the S., well repay the climber.

**Eisteddfod** (Welsh, session). Welsh national bardic festival: a public meeting at which contests are held in music, making or reciting poetry, writing prose, and arts and crafts of all kinds. Hardly a district in Wales does not hold a local Eisteddfod at least once a year; and the National Eisteddfod is held in N. and S. Wales alternately during the first week in Aug. The date of origin is not known, but certainly the holding of contests is an ancient custom among the Welsh. A festival held by Lord Rhys in Cardigan Castle in 1176 was "proclaimed" a year in advance in Wales, Ireland, Scotland, and England. There were two main contests, one for poets and one for musicians, and the winner in each contest was given a chair.

The next Eisteddfodau of which there are records were at Carmarthen (1450), and Caerwys (1523 and 1568). Probably many minor festivals were held in Wales during the 17th and 18th centuries, but they bore little resemblance to the modern Eisteddfod. In 1789 there were great assemblies at Llangollep and Corwen. Soon afterwards societies sprang up throughout Wales to foster literature and music and the Welsh language. In 1819 at Carmarthen the Gorsedd, with its colourful bardic rites, came for the first time



Eisteddfod. Ceremony of the Gorsedd, as held in 1939 at Bridgend, Glamorganshire; the sword of peace is being raised aloft

into the framework of the Eisteddfod. Contrary to popular belief, the bardic ceremony is not a legacy from the pre-Christian era, but an invention of Edward Williams (Iolo Morgannwg) in 1792. He meant the Gorsedd to take the place of the Eisteddfod, which however gained ground so quickly that he decided to make the former part of the latter. At Carmarthen, taking some pebbles out of his pocket and laying them in a circle on the ground, he started the tradition by which the great circle of stones is seen when the Gorsedd is held in the open air.

At the Denbigh Eisteddfod of 1860, a council was set up to organize a single annual festival for the nation. The council was replaced in 1880 by the National Eisteddfod Association, which became the National Eisteddfod Council in 1937. One of its functions is the publication of prize-winning works and adjudications. During the Second Great War the Eisteddfod was held in a curtailed form.

**Ejectment** (Lat. *ejectare*, to cast out). Name of an old English action to recover possession of land. Originally it could be brought only by a leaseholder and not by a freeholder; but by the fiction of John Doe (*q.v.*) judges allowed it to be made use of by freeholders, who preferred it to the cumbersome remedies of a writ of right, or a writ of Novel Disseisin. By the Common Land Procedure Act, 1852, John Doe was abolished, and now an action for the possession of land may be brought by anyone entitled to such possession. See Land Laws.

**Ejector**. Appliance for operating a vacuum brake by exhausting or ejecting air from the brake cylinders. It consists of a pipe within an outer casing with an annular space between the two. When steam is admitted to the pipe, in the act of escaping at the outer end it draws the air from the annular space which is connected by piping to the brake cylinders. Valves are provided for controlling the amount of steam and air admitted. The ejector is fitted in the driver's cab, and is controlled by the engine driver, but valves are provided in guards' vans so that a guard can apply the brakes independently. The same principle is used in many ways for moving liquids.

An ejector pump is one used principally for the drainage of flat districts and works by means of compressed air supplied from a

central station. The pressure of the air forces the drainage through a system of valves, until it reaches its discharging point. See Brake; Injector; Pump; Steam Engine.

**Eka** (Skt., one). Word used by Mendeléeff as a prefix for a hypothetical element which filled a blank in his arrangements of chemical elements according to the periodic table. By extension, ekaiodoform was the name given to a sterile iodoform produced by mixing with iodoform a small proportion of paraform.

**Ekaterrinburg**. Former name of the Russian town of Sverdlovsk, by which it was known when Tsar Nicholas II and his family were assassinated there on July 16, 1918. See Sverdlovsk.

**Ekhmin**, OR AKHMIN. Town of Egypt. It stands on the Nile 70 m. above Assiut. For more than 2,000 years it has been the chief centre for the manufacture of the cotton shawls used by the natives. Here are the remains of the temple of Pan (the Egyptian Amsu or Min) and other ruins, and an extensive Egyptian and Roman cemetery. In early Christian times Ekhmin was an important Christian centre. In the neighbourhood, near the village of Hawawish, have been found valuable papyri, including the "Gospel of Saint Peter." Pop. 28,000.

**Ekron**. Ancient town of the Philistines. It is the modern Akir, a small village in Palestine, situated 23 m. W. of Jerusalem. A Jewish colony was established here by Lord Rothschild in 1884.

**El**. Variant of al, the definite article in Arabic. In this encyclopedia the word is treated like its English equivalent, the, and not considered part of a heading; thus, El Agheila will be found under Agheila, El. The popular term El Alamein was wrong, as it included a duplicated prefix. See Al.

**Elaeagnaceae** (Gr. *elaia*, olive; *hagnos*, pure). Small family of shrubs and trees, natives of the N. temperate and tropical zones. They are more or less covered with silvery or brown scales. They have entire leaves, and small white or yellow flowers. The fruit is membranous, and enclosed in the tube of the calyx. The two best known species are the oleaster (*Elaeagnus*) and sea buckthorn (*Hippophae*).

**Elaeocarpus** (Gr. *elaia*, olive; *karpós*, fruit). Genus of evergreen shrubs and trees of the family Elaeocarpaceae. Natives of the East Indies and Australia, they have alternate, lance-shaped or

oblong leaves, and small, white, fragrant flowers in sprays. The cherry-like fruit has a rough-shelled seed.

**Elaeococca** (Gr. *elaia*, olive; *kokkos*, seed). Genus of plants of the family Euphorbiaceae. They are natives of China and Japan. The seeds by pressure yield valuable oil, and those from *E. verrucosa*, a Japanese plant, are used for burning in lamps; from a Chinese species, *E. vernicia*, is obtained an oil useful for mixing paints.

**Elaelite** (Gr. *elaia*, olive; *lithos*, stone). A variety of the mineral nepheline, theoretically a silicate of sodium and aluminium ( $\text{NaAlSi}_3\text{O}_8$ ) but always containing excess silica and a little potash. Current usage tends to drop the name in favour of nepheline. Elaelite generally occurs in massive form, rarely in coarse crystals: it is usually cloudy with minute inclusions and has a greasy lustre. It is characteristic of certain granular alkaline plutonic rocks. See Nepheline.

**Elagabalus** OR HELIOGABALUS. Roman emperor A.D. 218-222.

The son of Sextus Varius Marcellus and Julia Soaemias he was originally called Varius Avitus Bassianus. He was born and brought up at Emesa in Syria, where at the age of 13 he was made priest of



Elagabalus,  
Roman emperor  
Bust in the  
Capitol, Rome

Elagabalus, the Syrian sun-god, and assumed his name. By pretending that he was the natural son of Caracalla, his grandmother, Julia Maesa, persuaded the legions in Syria to proclaim him emperor, under the name of Marcus Aurelius Antoninus.

Abandoning the reins of government to his mother and grandmother, he devoted the first year of his reign at Rome to the introduction of the worship of the sun-god, represented by a large conical black stone which he had brought with him from the East. A sexual pervert, his short reign was a continuous orgy of vice. An attempt to murder his cousin Alexander, whom the senate had induced him to adopt as his successor, was frustrated by the praetorian guards, who took Alexander under their protection and afterwards murdered Elagabalus, March 11, 222.

**Elaine.** (1) Character in La Morte d'Arthur. She was the daughter of King Pelles and married Sir Lancelot. Their son was the blameless knight Sir Galahad, who achieved the Holy Grail. (2) Daughter of Sir Bernard of Astolat and known as the Maid of Astolat. Her story appears in Tennyson's *Idylls of the King* (*q.v.*).

**Elam.** Biblical name for a low land and mountain region in S.W. Persia, N. of the Persian Gulf. Partly known also as Elymais, it comprised the lowlands E. of the Tigris, with the highlands lying N and E. Wars were frequent between the Assyrians and the Elamites, and Ashurbanipal conquered the latter in 644 B.C. Susa the Biblical Shushan. In Persia became the capital of the country, which was watered by the Kerkha (Choaspes). Its neolithic population, perhaps anterior to but allied with the Sumerian, developed their agglutinative speech, picture-writing and industrial art under local impulses. At one time dominating Babylonia, it afterwards became subject, allied or independent, and experienced both Semitic and Iranian infiltration. Its vigorous native art excelled especially in metal-casting and jewelry. See Babylonia; Mesopotamia; Susa.

**Elamites.** People of ancient Elam. The ethnic relationships of the Elamites await further research. Although the early human remains are scanty, a shortish, long-headed, black-haired, glabrous stock, allied to the Mediterranean brown race, apparently occupied this region. Semitic intermixture gave them a ruling class, afterwards affected by Aryan elements, resulting in the racial strains discernible in the early Persian domination. The Elamites of Acts ii descended from Jewish settlers in Shushan after the exile, having no ethnic affinity with the native people, whose characters are now submerged under the Beni Lam Arabs of the modern Persian province of Arabistan.

**Elan.** River of mid-Wales. It rises on the E. boundary of Cardiganshire, and flows S.E. through the W. portion of Radnorshire to Brecknockshire, where it turns N.E. to form the boundary of these counties and enters the Wye after a course of 15 m. The water-sheds of the Elan and Claerwen, its tributary, have been acquired by Bir-



Elaine, the beautiful daughter of King Pelles, in the Arthurian tales, as depicted by Mouat London

By permission of the artist

mingham, and three reservoirs have been constructed on the Elan, whence the water is carried to the city by an aqueduct 74 m. long.

**Eland.** Genus of large antelopes, found only in Africa. They are the largest of all the antelopes, a fine bull standing nearly 6 ft. high at the withers. In colour, they vary from light fawn to grey, and the bulls usually have a thick tuft of dark hair on the forehead. Both sexes bear horns, about 2 ft. in length, and more or less twisted. They are found in most parts of E. Africa, but appear to be extinct in the South. They frequent wooded districts, and go in herds of fifty or more. Attempts have been made to acclimatise them in Great Britain, where they do well in parks, but they mature so slowly that they cost more in food than they are worth.

**Elandslaagte.** Village in Natal, known for an engagement in the early part of the S. African War. It is on the hills, 16 m. N.E. of Ladysmith, 3,614 ft. above sea

level. On Oct. 21, 1899, General French, with a small force moved out of Ladysmith to attack the Boer positions in the hills. He had with him only a few hundred men, but as the artillery duel was opening he realized that he was outnumbered and telephoned back for reinforcements. British battalions, Gordon Highlanders and Devons, were soon on the scene, also some Lancers and other cavalry, and the attack was pressed, the British advancing in open order up the hills. The Boer artillery was weaker than the British, and with a few casualties their position was taken. Some Boers resisted, but the majority rode away, while about 200 were made prisoners. The British lost 41 killed and 220 wounded; the Boers about 250.

**Elasmobranchs** (Gr. *elasmos*, metal plate; *branchia*, gills). A group of fishes, which includes sharks and rays. They are characterised by the possession of cartilaginous or gristly skeletons, though sometimes the cartilage is partly calcified. The scales are distant, and are homologous with the teeth in all vertebrates. The external gill openings are not protected by plates: the mouth is usually placed on the under side; there is no swim-bladder: and the two tail fins are of unequal length. Only the sharks and rays still exist. Marine in habit, they occasionally ascend rivers.

**Elastic.** Term more particularly used for a special fabric containing strands of rubber, usually made in the form of tapes, cords, and bands. The word is derived from an assumed Gr. form, *elastikos*, from *elavnein*, to drive, set in motion. See Elasticity; Rubber.

**Elasticity.** Property of matter in virtue of which it resists change in shape or bulk, and tends, after distortion, to recover its original shape or bulk when allowed to do so. Fluids have no fixed shape, and therefore no power to resist change of shape; they have no "elasticity of form"; but they resist compression and have "elasticity of bulk." Solids possess both kinds of elasticity.

An external force producing distortion in a body is known as a "stress" (strictly the force per unit area) and the distortion itself is called a "strain." The mathematical theory of elasticity deals with the various kinds of strain which a body may suffer, and the stresses corresponding thereto. If the strains are small, the general principle of the relation between stress and strain is "Hooke's



Eland. Specimen of the large gregarious antelopes found in most parts of East Africa



Law"—the stress is proportional to the strain it produces. It is generally assumed that the strain is small, as the elasticity of a solid has a definite limit (the "elastic limit"), and when the strain exceeds this limit it produces a permanent deformation, or actual fracture if the "yield-point" is reached. When a body is strained beyond the elastic limit by rapidly varying forces, it may be broken by a load less than the normal maximum.

#### Hooke's Law of Stress and Strain

A simple example of Hooke's Law is afforded by a steel wire stretched under the tension of a weight suspended from it. Hence the weight per unit area of cross-section is the stress, the longitudinal extension per unit length of the wire the strain, and it is found that for comparatively small strains the extension is proportional to the weight. Moreover, if wires of the same material, but of different lengths and thicknesses, are compared, the ratio of stress to strain is still constant, if each is measured on a suitable scale. For any given material, such as steel, the ratio of stress to strain is constant, and this constant number is called "Young's modulus" for the material. For steel wire it is about 13,000 tons to the square inch, and from this it is easy to calculate the longitudinal extension of a steel wire of any given length and cross-section, when stretched by a known weight.

In this case the wire suffers a change in volume as well as in form; the longitudinal expansion is accompanied by a slight lateral contraction, but the volume of the wire is on the whole increased. A strain in which there is pure change of form with no change of volume is known as a "simple shear"; it can be illustrated by twisting a wire. Here, again, for small twists the ratio of the "shearing stress" to the "shearing strain" is constant, this constant being known as the "rigidity." When a solid or a liquid is compressed, the ratio of the compressing force per unit of surface area (stress) to the proportionate diminution in volume (strain) gives another constant, the "volume elasticity," or "bulk modulus."

The theory of elasticity is of great importance to the engineer who has to deal in every kind of structure and machine with materials in various states of strain. See Materials, Strength of.

**Elastic Limit** OR **LIMIT OF PROPORTIONALITY.** When a metal



Elba. Fortress of Porto Ferrajo, the capital. Above the harbour is the palace of Napoleon I

or alloy is subjected to any stress, perhaps in tension, compression, or torsion, it becomes deformed. Up to a certain point, termed the elastic limit, the deformation is elastic; i.e. the metal will return to its original shape when the stress is removed. Once the stress exceeds this limit the metal becomes permanently distorted. The measurement of this property is important to engineers and is usually determined during a tensile test (*q.v.*).

**Elastic Modulus.** In a stress-strain curve, the ratio of the load to the extension of the metal, or more properly of the stress to the strain, before the elastic limit is reached. The figure for any particular metal or alloy is much the same, whether the strain is a change in length due to tension or in bulk due to compression. It is usually slightly lower in shear.

**Elastic Recovery.** When a steel is stressed beyond the elastic limit, it becomes plastically deformed. This lowers the elastic limit considerably and a small stress afterwards will produce a plastic change. But after several days the steel recovers its elasticity almost to the original value; this phenomenon is known as elastic recovery and the effect may be speeded up by heating to temperatures between 100–300° C.

**Elaterite.** Brown, rubber-like, bituminous substance of unknown chemical composition and origin. It occurs in joint and other planes in the carboniferous limestone of Derbyshire, the type locality being at Castleton.

**Elatinaceae.** Family of herbs and small shrubs, distributed generally over the globe. They are mostly small annuals, growing in marshes, with opposite or whorled leaves. The minute flowers have two to six sepals and a like number of petals, and the fruit is a membranous capsule, containing many seeds. Some of the plants are acid, known as water-peppers.

**Elba** (Gr. *Aithalia*; Lat. *Iwa*). Island of the Mediterranean, belonging to Italy and included in the prov. of Leghorn. It lies 6 m.

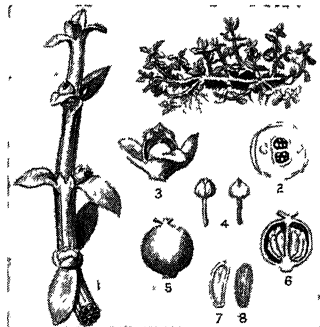
S.W. of Piombino, the nearest point on the mainland, and is 19 m. long by 6 m. broad, with an area of about 90 sq. m. It is wholly mountainous, rising to 3,350 ft. in Monte Capanne, with fertile valleys. The produce of the island includes iron, which has been

worked from antiquity, salt, granite, marble, chalk, and wine. Many of its fisher-folk are engaged in the tunny and sardine fisheries.

The capital is Porto Ferrajo (*q.v.*) on the N. coast, the residence of Napoleon while in exile, May 5, 1814–Feb. 26, 1815. He had also a villa a few miles S.W. of the town and a country house on Monte Capanne. Porto Longone and Rio Marina are among the chief villages. Pop. 26,000.

In 453 B.C. Elba was laid waste by the Syracusans. It has belonged to Pisa, Florence, Spain, Naples, France, Tuscany, and since 1860 Italy. In the Second Great War Elba was garrisoned by Italians until the surrender of Italy in Sept., 1943, whereupon German troops occupied the island. French troops, supported by Allied warships and aircraft, landed at several points on June 17, capturing Porto Ferrajo next day. All organized resistance ceased on June 19. An attempted rescue that night of isolated Germans was frustrated.

**Elbasan.** Town of Albania. On the Skumbi, about 65 m. W. of Bitolj (Monastir), it is one of the few important towns of the country, and is the seat of a Greek bishop. It has hot sulphur springs. During the First Great War it was the headquarters for a short



Elatinaceae. 1. Flowering branch of *Elatin americana*, magnified. 2. Diagram of a dimerous flower. 3. A flower, more magnified. 4. A magnified stamen, outside and inside view. 5. Pistil, magnified. 6. Pistil, vertical section, showing placenta. 7. Transverse section of seed. 8. Magnified seed

time of a government formed by Essad Pasha, the Albanian notable who sided with the Allies. After their conquest of Montenegro and N. Albania, the Austrians occupied Elbasan, 1916-18. It gives its name to a prefecture. Pop. 13,796.

**Elbe** (anc. *Albis*). River of North-Central Europe. It rises in a number of streams which unite at the foot of the Schneekoppe, a lofty summit of the Giant Mts. (Riesengebirge), which extend along the N.E. boundary of Bohemia. From this mountain, at an alt. of 4,500 ft., it flows S. and W. to Melnik, the head of navigation, 21 m. N. of Prague. It penetrates the Mittelgebirge and the Erzgebirge, waters Saxony, and pursues a N.W. trend to fall into the North Sea, near Cuxhaven, through an estuary of 70 m. between Holstein and Hanover.

At its mouth it is nearly 14 m. in width, its length is 725 m., and its drainage area about 57,000 sq. m. It is navigable by small steamers for more than 500 m., as far as its junction with the Moldau at Melnik. The tide is perceptible as far as Geesthacht, about 110 m. from its mouth. Besides the Moldau, the chief of its many tributaries are the Havel, Saale, Eger, and Mulde. The Elbe is linked by a series of canals with the Oder, the Spree, and the Trave, the last, opened in 1900, connecting Lübeck with Lauenburg. Hamburg, Magdeburg, Wittenburg, Torgau, Meissen, Dresden, Aussig, Leitmeritz, and Pardubitz are important places on its banks.

There is an enormous traffic along the Elbe, principally by barges, which are assisted by an ingeniously contrived towing chain. Immense quantities of timber are floated downstream from the forests of Bohemia. Fish include sturgeon, salmon, pike, and shad.

Before the Allies invaded Europe during the Second Great War many towns on the Elbe had been heavily attacked by Allied aircraft, Hamburg and Magdeburg being partially destroyed. In 1945 U.S. armoured formations of the 9th army made a lightning thrust across central Germany to the river, which was crossed on April 12. They established an 85-mile front along the Elbe from N. of Stendal to S. of Magdeburg, which was heavily bombed on April 17 and captured next day. German infantry, supported by tanks, launched counter-attacks at Barby. On April 19 about 10,000 Germans, with tanks, who had been cut off in the Harz pocket, made a surprise attack

behind the American lines in a desperate attempt to break through to the Elbe, one column advancing 15 m. to Koltze.

That day the British 11th armoured division cleared Lüneburg and reached the lower Elbe about 20 m. S.E. of Hamburg, and soon the British controlled a 35-mile stretch of the W. bank. U.S. 1st army troops were N.E. of Dessau by the 24th, and next day contact was established between the U.S. and Russian armies on the Elbe near Torgau. A British force crossed the river near Lauenburg, capturing the town and establishing a bridgehead, while the U.S. 82nd airborne division made another crossing upstream at Bleckede. Between the Weser and the Elbe the Guards armoured division was engaged in clearing the Cuxhaven peninsula.

On April 30 troops of the U.S. 9th army broke out of the Barby bridgehead and linked with the Russians at Apollensdorf. The British and American bridgeheads on the lower Elbe were joined by May 2, controlling 50 m. of the river, while two thrusts were made to the Baltic. On the 3rd the defence system in N.W. Germany collapsed and Hamburg surrendered to the British 2nd army, all German forces in this area surrendering unconditionally to the 21st army group next day. The Guards armoured division entered Cuxhaven on May 7, and the U.S. 9th army withdrew from territory E. of the Elbe in accordance with the demarcation agreement with Russia. Dresden was entered by the Russians on May 8.

**Elberfeld.** This industrial town in N.W. Germany, with its twin town Barmen, is described under Wuppertal (*q.v.*).

**Elbert.** Granite mt. of Colorado, U.S.A. The highest peak of the Sawatch group of the Rockies, having an alt. of 14,421 ft.

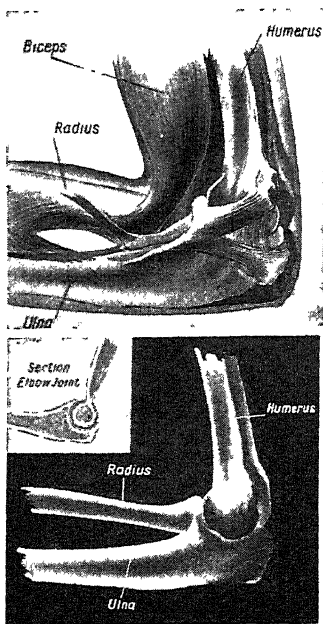
**Elbeuf.** Town of France. It stands on the left bank of the Seine, in the dept. of Seine-Inférieure, 12 m. S.S.W. of Rouen. Across the river is the suburb of St. Aubin. The chief buildings are the Renaissance churches of S. Jean and S. Etienne, and the town hall. There is a museum, and several technical and other schools. The main industry is the making of woollen goods. Elbeuf gives its name to a forest around the town, and at one time there was a duke of Elbeuf. Occupied by the Germans in the middle of June, 1940, the town was included in the German-occupied zone after the defeat of

France. It was liberated by troops of the 1st Canadian army, Aug. 25, 1944. Pop. 15,958.

**Elbing.** Town and seaport in what was left from 1919 of West Prussia and embodied with East Prussia. It is on the Elbing river and a canal linking it with the Vistula, 5 m. from the Baltic, in the Frisches Haff, and 45 m. E.S.E. of Danzig. Its main importance was derived from a shipyard, and during 1934-45 from motor-car, locomotive, tractor, and cigar factories; it also had engineering, furniture, and chocolate industries. Founded 1237 by Lübeck merchants around a castle of the Teutonic Knights, it was a member of the Hanseatic League, broke with the Knights in 1454 and accepted Poland's protection, fell to Prussia in 1772, and then recovered part of the importance it was losing to Danzig. The old town had the remarkable R. C. church of S. Nicolas (13th century), S. Mary's (13th-16th), Corpus Christi (13th), S. George's chapel (14th). Elbing had a short-lived prosperity when Hitler started a new navy; torpedo boats and U-boats were built here, and an unfinished aircraft carrier lay in its docks when the town was taken by the Russians on Feb. 10, 1945, after violent street fighting. The town was placed under Polish administration, July, 1945.

**Elbow.** Joint formed by articulation of the lower end of the humerus, or upper arm bone, with the radius and ulna, the two bones of the forearm. The articulation between the ulna and the humerus forms what is termed a hinge-joint, a deep notch in the ulna, the greater sigmoid cavity, gliding backwards and forwards over the trochlear surface of the humerus. The disk-shaped head of the radius contains a depression which articulates with a prominence on the humerus termed the *capitulum*; the edge of the disk articulates with the small sigmoid cavity of the ulna. These articulations permit the rotation of the forearm. The tip of the elbow is formed by a process of bone called the olecranon; the bony prominences, which can be felt on the inside and outside of the elbow when the arm is held with the palm of the hand facing forwards (supination), are the internal and external condyles of the humerus.

**INJURIES TO THE ELBOW.** These may involve both radius and ulna together, or only one bone. The most frequent dislocation of the



Elbow. Diagram showing the three bones forming the joint; above, relations of the bones and muscles

two bones together is backwards, and may be associated with fracture of the olecranon, or the coronoid process, a prominence which forms the lower part of the greater sigmoid notch. This condition is accompanied by pain, swelling, and changes in the relative positions of the bony joints to each other, the forearm being kept partially bent and the hand held midway between supination and pronation, i.e. between complete external and internal rotation. The dislocation can usually be reduced without much difficulty by skilled hands, but patients should not be encouraged to reduce dislocations themselves.

Dislocations of both bones forwards or sideways are much less frequent. When a single bone is dislocated it is more frequently the radius, since the articulation between it and the humerus is less firm and close than that between the ulna and the humerus. In forward dislocation of the radius the head of the bone rests against the front of the lower end of the humerus, which prevents the patient from completely bending his elbow. The surgeon pulls the forearm forwards while it is bent at a right angle, and at the same time presses the head of the bone back into its place.

Sprain of the elbow, or "pulled elbow," is an accident not infrequent in young children, in which

the head of the radius slips down, and one of the ligaments becomes nipped between the radius and humerus. The doctor replaces it by bending the limb and then extending it. Fractures of the bones forming the elbow-joint frequently complicate dislocation. The humerus may be broken across just above the condyles, or either condyle may be fractured.

**DISEASES OF THE ELBOW.** Tuberculosis of the elbow is more frequent in children than in adults. The joint becomes swollen and painful, and chronic abscesses form which may extend to the surface and break through the skin, thus giving rise to a sinus. Treatment consists in keeping the limb at rest and building up the general constitution. Sometimes surgical measures are appropriate. Arthritis of the elbow joint may be the result of septic or gonorrhoeal infection. Synovitis which may be acute or chronic, is inflammation of the synovial membrane which lines the joint. Inflammation and enlargement of the bursa, which lies over the olecranon process, gives rise to the condition known as "miner's elbow."

Tennis elbow is an incomplete tear of the triceps tendon at its insertion on the bone, pain being produced by pressure on the nerve endings of the part. It occurs suddenly when the handling of a tennis racket throws undue strain on the muscle. The treatment is rest and massage after the surgeon has completed the tear. See Arm; Dislocation illius.

**Elbruz or ELBURZ.** Highest mountain of the Caucasus. It is a little to the N. of the main chain, in the Kabardin autonomous republic of Russia. It consists of two extinct volcanic peaks, the higher about 18,467 ft. Elbruz was first ascended in 1829. According to tradition, it was the first resting-place of the Ark.

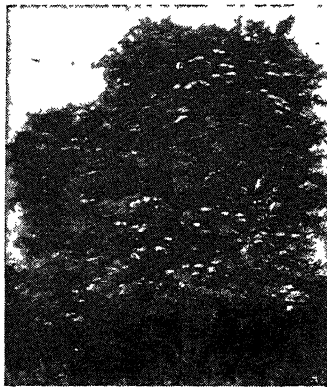
**Elburz.** Mountain range skirting the S. shore of the Caspian. It extends for a length of 600 m., and to a width in places of 200 m., through N.W. Persia. On its N. slopes are fertile valleys, and at various points naphtha and petrol are found in considerable quantities. The highest peak is the volcano, Mt. Demavend (*q.v.*).

**Elche.** Town of Spain, in the prov. of Alicante. It stands on the Vinalapo, 13 m. by rly. S.W. of Alicante. Of Moorish appearance, with flat-topped white-washed houses, open squares, and narrow streets, the town is nearly surrounded by plantations of date

palms, the fruit being exported as "Barbary" dates. It has an ancient castle of the duke of Altamira, and a handsome church (Santa Maria), with a beautiful blue-tiled dome. An important rly. junction, it carries on a trade in figs, olives, almonds, and exports esparto grass, mats, and rope shoes. Santa Pola, its port, lies 2 m. S.E. At the feast of the Assumption a 14th century religious drama with music is performed. Pop. 33,870. *Pron.* El-chay.

**Elchingen.** Village of Germany, in Bavaria. It stands on the Danube, 8 m. N.E. of Ulm, and is famous for the battle fought there between the French and the Austrians, Oct. 14, 1805. This was part of the campaign that ended in the capitulation of the Austrians at Ulm and their defeat at Austerlitz. The two armies met at the bridge which here crosses the Danube, and which was then in ruins. The French, however, quickly remade it, and the army got across. The Austrians under Mack were already demoralised, only one part of the army stood to fight, and this was hampered by difficulties of every kind. The chief feature was the surrender of a large number of Austrians. Ney was made duke of Elchingen as a reward for his services there. See Ulm, Campaign of.

**Elder** (*Sambucus*). Group of hardy shrubby trees, natives of Britain, of the family Caprifoliaceae.



Elder. A large specimen of *Sambucus nigra* in bloom

Their height is about 10 ft.; the flowers are white and variegated. They can be grown in any ordinary soil in open shrubberies. There are a few varieties of S. European origin, but they are rarely seen to advantage in British shrubberies. They are propagated by cuttings in autumn or spring. *S. nigra* is the familiar native elder, the

berries of which are used for the manufacture of home-made wine. A liquid distilled from the flowers, elder-flower water, is used for flavouring confectionery. Owing to its lightness, the pith is made into balls much used in electrical experiments.

**Elder.** Word used in a civil and an eccles. sense for an overseer. Of frequent occurrence in the Bible, in the O.T. it is applied to the heads or representatives of tribes and families, especially of the Israelites, as the word sheikh is among the Arabs. In the N.T. it is used to define officers of the Church who originally may have been identical with the bishops. Certain office-bearers in the Presbyterian and other churches are called elders. The word alderman (*q.v.*) is a familiar English equivalent of the word. See Bishop; Kirk Session; Presbyter.

**Elder Brethren of the Trinity House.** Members of the corporation of Trinity House, Tower Hill, London, E.C., sometimes known as Trinity Masters. They consist of members of the royal family, prominent statesmen, retired naval officers of high rank, and commanders in the mercantile marine. Nine active Elder Brethren, when required, assist the judges of the admiralty division as nautical assessors in shipping cases. The tenth, deputy master, does not act as an assessor. See Trinity House.

**Elder Dempster Lines.** British steamship line. It was founded in 1868 by Alexander Elder and

of motor vessels. It lost 25 ships out of a fleet of 41 during the Second Great War. The head offices are at 3, Linnet Lane, Liverpool, and the London office at Fenton House, Fenchurch St.

**Eldon, JOHN SCOTT, 1ST EARL OF (1751-1838).** British lawyer. He was born at Newcastle-upon-Tyne, June 4, 1751, son of a coal merchant. He was educated at the town grammar school, and University College, Oxford, where he was for a time a tutor. He did not, as at first intended, enter the Church, but in 1776 was called to the bar and soon began to practise in London; in 1782 he became a K.C.

That year Scott entered parliament as M.P. for Weobley. He forced himself into notice by frequent speeches, and in 1788 Pitt made him solicitor-general. In 1793 he was promoted attorney-general, and in 1799, having conducted the prosecution of Horne Tooke and others holding republican ideas, he was made chief justice of the court of common pleas, and a peer, as Baron Eldon. Lord chancellor from 1801, he left the post on Pitt's death in 1806, but in 1807 returned to fill it for 20 years, a longer period than any other chancellor. He was the most powerful man in Lord Liverpool's reactionary cabinet, and his methods are a classical example of caution and dread of innovation. He resigned in 1827 and died Jan. 13, 1838.

Eldon married Elizabeth Surtees, the daughter of a banker, having run away with her in 1772. His two sons died before him, and his titles—he had been made an earl in 1821—passed to his grandson John (1805-54). A descendant, John (b. 1899) became 4th earl in 1926. The eldest son is known as Viscount Encombe. Eldon's elder brother, William Scott, a distinguished lawyer, was in 1821 created Baron Stowell. *Consult Lives of the Lord Chancellors, Lord Campbell, 3rd ed., 1848.*

**El Dorado** (Span., The Gilded One). Name successively applied to a gilded man, a golden city known as Manoa or Omoa, and a region abounding in gold and precious stones, reputed to exist

in S. America. The El Dorado legend apparently originated in a custom said to have been observed by an Indian tribe dwelling on the tableland of Bogotá at the installation of a new chief. His naked body, after being smeared with balsam, was covered with gold-dust, and he plunged into the sacred lake of Guatavita, whilst the assembly cast gold and precious stones into the water.

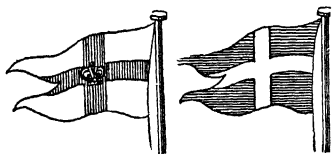
The Spaniards in America put such faith in the El Dorado legend that the governors of Guiana were styled also governors of El Dorado. They organized many fruitless expeditions in search of the legendary city, Manoa, the earliest being led by a German governor of Guiana, Ambrose Dalfinger, in 1529. In 1595 Sir Walter Raleigh claimed to have located Manoa on an island in Lake Parima, but this lake was proved by the 19th century German traveller, von Humboldt, to be non-existent. The name El Dorado came to be applied to any place reputed to abound in easily acquired wealth.

**Eleanor of AQUITAINE** (c. 1122-1204). Queen of Henry II of England. The eldest daughter of William, duke of Aquitaine, her first husband was Louis VII of France, to whom she was married in 1137. Her dowry was the great duchy of Aquitaine. In a short time Eleanor and Louis were on bad terms, and in 1152 the marriage was dissolved. In the same year she married Henry of Anjou, who became king of England in 1154. She was the mother by Henry of the quarrelsome princes who disturbed his reign. Indulgent to them, the queen was concerned in the revolt of 1173. She moved about in France trying to help John in his fight against Richard I. She died April 1, 1204. *Consult Life, C. B. Reed, 1928.*

**Eleanor of CASTILE** (d. 1290). Queen of Edward I of England. The daughter of Ferdinand III, king of Castile, she was married to Edward in Oct., 1254. She fled to France in 1264 when her husband was worsted by the barons, and was in Palestine with him in 1270. She died at Harby, Notts, Nov. 28, 1290, and was buried at Westminster. The king erected crosses, known as Eleanor crosses, at the places at which her body rested on the journey—Lincoln, Grantham, Stamford, Geddington, Northampton, Stony Stratford, Woburn, Dunstable, S. Albans, Waltham, Westcheap, Charing Cross. *Consult Queens of England, A. Strickland.*



*Eldon*  
After Lawrence



Elder Dempster Lines flags. Left, African Steamship Co. Right, British and African Steam Navigation Co.

John Dempster, and reorganized as a registered company in 1910. It manages the African Steamship Co., and the British and African Steam Navigation Co., which have maintained passenger and cargo services to West Africa since 1852, and also the Elder and Imperial Direct Lines. Principal services are from Liverpool and London to the Continent and W. Africa; New York to W. Africa; and Canada to South Africa, the last being operated by Elder Dempster Lines (Canada) Ltd. The company has been a pioneer in the use

**Eleanor of Provence** (d. 1291). Queen of Henry III. of England. The daughter of the count of Provence, she was brought up amid the poets and troubadours there. In 1236 she was married to Henry at Canterbury. Throughout her residence in England she was most unpopular. The charges against her resolve themselves into a love of foreign relatives and avarice. In 1276 she entered a religious house at Amesbury, where she died June 25, 1291. *Consult* Queens of England, A. Strickland, vol. i, 1840.

**Eleatic School.** One of the chief pre-Socratic Greek philosophical schools. It was founded by Xenophanes of Colophon at Elea in Lucania in lower Italy; its other chief representatives were Parmenides and Zeno (both of Elea), and Melissus of Samos. The kernel of their doctrines was the unity and unalterableness of Being (that which really had a right to the name of existence), the unreality of Becoming (material changes), of Plurality, and of sensual perceptions. The real nature of things, they held, cannot be perceived by the senses, but is attainable only by thought. All that is given us by the senses is mere appearance. Since the senses show us only plurality and the manifold, and since the separate parts of the world, such as it presents itself to our senses, both differ in themselves and are subject to constant change and movement, they asserted that Being was only one, unchangeable, and immovable. Only Being is; non-Being is not; there is no Becoming. Starting from the assumption that the idea of real Being excludes anything contradictory, the Eleatics argued that Plurality, and above all Movement, could be neither Being itself nor found in connexion with Being.

**Election** (Lat. *electio*, choice). Term used in English law. A man has sometimes to choose which of two courses he will take. Thus, if A. B. sells me first quality oats and delivers second quality, I can either reject them altogether or keep them and pay for them, counter-claiming for breach of warranty of quality. But I cannot keep the oats and decline to pay. If I do not forthwith reject them I have *elect*ed to keep them. Again, circumstances sometimes arise when one has to choose, or elect, whether one will retain the benefit of a gift *inter vivos* (among the living), as, for instance, under a marriage settlement or a deed of appointment;

or give it up and take a benefit under a will. Election implies knowledge; that is, a man can elect only where he knows his rights.

**Election.** Term used in theology for the doctrine that God from eternity has chosen certain persons for eternal life. In the O.T. the term elect is applied to the Israelites, as the chosen people of God. In the N.T. the members of the Christian Church are called the elect in 1 Peter 2, and in S. Paul's epistles to Thessalonians, Colossians, and Timothy. The Calvinistic view that God has elected certain persons to be saved and others lost, and this solely by His own will and irrespective of any merit or demerit in the individuals, was never held before the Reformation. The usual view was to identify the elect with the baptized, in the sense that they had been chosen and called to a Christian profession; but to recognize the possibility of falling away from such a profession. Only those who persevered in Christian living to the end could be regarded as the people whom God had foreknown and chosen from the beginning as His faithful followers. The Catholic Church has never maintained that election of the faithful implied condemnation of those denied the opportunity of election.

**Election.** In politics, and to some extent in business, the choosing of representatives. The methods of election vary, but usually a bare majority of votes is sufficient to secure election, although this may be either a majority of the votes cast, or a majority of those entitled to vote.

The first elections were decided by the casting of lots, a method in force among the Greeks and Romans, but later ideas were averse to this. Election by the votes of the electors began with the growth of the idea of representation. In the 12th century, perhaps earlier, the reeve and four men represented the village communities of England on occasions, and in some rough manner these four men were elected by those for whom they spoke. The system grew with the growth of parliamentary institutions; knights of the shire, and burgesses for the boroughs, were elected, as well as other officials. Until modern times the method was rough; those present held up their hands, or shouted, much as they do at a public meeting today, and it was the sheriff's duty to declare which men were thus elected.

There is proof that the sheriffs abused their power, declaring the election of persons not rightly chosen, and checks upon them were introduced. For parliamentary elections there came in the method of open voting on the hustings (*q.v.*) and then the present system, which belongs to the 19th century. It includes voting by ballot, a careful enumeration of the votes cast, and, if necessary, a scrutiny and recount; indeed, every possible device to secure that the wishes of the voters prevail.

British parliamentary elections are divided into general and by. A general election is one held at a stated time after the dissolution of parliament. A by-election takes place when death or some other cause renders a seat vacant. In elections for many local bodies, *e.g.* town councils in England, it is customary for one-third of the members to retire every year, so there is never a general election. County councils in England have a full election every third year.

There is a fundamental division between direct and indirect elections. In the former the voters themselves choose their representatives, each voter having as many votes as there are members to be elected. Elections to the house of commons are the best known of this kind. At indirect elections the electors choose certain men who, in their turn, elect the actual representative. The most notable existing instance of this kind is the choosing of the American president by a college of electors. The Venetian republic had an elaborate system of indirect election when choosing a doge. The election of aldermen in English boroughs and county councils is a somewhat different kind of indirect election; they are chosen from among themselves by the directly elected councillors, who are not, however, returned solely, or even mainly, for this duty.

Elections at the best are but a crude test of the people's will, so vast are the numbers engaged, and so great the possibilities of manipulation. It has happened more than once that a minority of voters return a majority of members to the British house of commons. To make this impossible, and also to secure the representation of minorities, various proposals—proportional representation, second ballot, alternative vote—have been put forward.

At elections of company directors a show of hands is usually sufficient, but, under certain con-

ditions, those dissatisfied with the decision can demand a poll. In elections of this kind, unlike political ones, the shareholders have votes in proportion to their interest in the company. A further device prevails at elections of members to clubs and societies. There a small number of members can keep out a candidate by voting against him; this is called blackballing, from the practice of using black balls for this purpose. Election is the term used for the choice of fellows or scholars at the colleges of Oxford and Cambridge. Professors are also usually elected. *See* Alternative Vote; Ballot; General Election; Hustings; Proportional Representation; Vote.

**Electoral Commission.** Name given to the body of men created by an act of Congress in the U.S.A., Jan. 29, 1877, to settle certain disputed questions in connexion with the electoral votes of four states in the presidential election of 1876. It was the only disputed election in American history. It was decided to create a commission to determine which of two or more conflicting certificates received from any state of the votes cast by the electoral college of such state for president and vice-president in the 1876 election was the certificate provided for in the constitution. The judgement in each case was that the certificate of the votes cast for Rutherford B. Hayes and William A. Wheeler, the republican candidates for president and vice-president respectively was the certificate containing the lawful electoral vote of the said state. The other certificates were declared void. The electoral votes were then counted, and Hayes and Wheeler were declared elected.

**Electoral Roll.** List of electors in a parish of the Church of England. They may be of either sex, but not less than 18 years old, baptized, and declaring themselves to be members of the Established Church and of no other religious body. If residing in another parish, a person can qualify by attending for one year at public worship at the church. Duties are exercised at the annual parochial church meeting.

**Electoral Truce.** Cessation of rivalry at the polls between opposing political parties. In a three-cornered fight at an election the two parties most closely related politically may come to an arrangement by which one will agree not to contest the seat, thereby avoiding splitting the votes. The term was also used

during the Second Great War to indicate that parties which broadly supported the National government would not oppose one another at by-elections.

**Electors.** Term used in two special senses. (1) The German princes who in the Holy Roman Empire voted at the election of the king. Like many other early peoples, the Germans elected their kings; but, unlike them, they retained this practice—at least, in theory—until modern times. These elections may be said to have begun with the choice of Conrad I as king in 911, but it was often merely a form, the eldest son of the late king being confirmed as ruler, as was Otto the Great. The electors were powerful when there was no obvious successor to the throne, two or more candidates claiming it, as in 1198, and more so after the death of Frederick II in 1250. At first all the princes took part, or were entitled to take part, in the elections, but soon many of them ceased to attend. In 1257 the number taking part was seven. This number became fixed, was recognized by the pope, and at Aix-la-Chapelle statues of the seven were erected.

Trouble then arose as to who were the favoured seven. The archbishop of Mainz and the elector palatine of the Rhine were acknowledged to be electors, but in other cases there were difficulties, especially when two men divided a duchy between them. The matter was settled in the Golden Bull issued by Charles IV in 1356, which fixed the number at seven, who were named. Three were archbishops—Mainz, Cologne, and Trèves—and the other four were the elector palatine, the duke of Saxony, the margrave of Brandenburg, and the king of Bohemia. Each held an office at the emperor's court. The clerics were archchancellors for his three kingdoms, Germany, Italy, and Burgundy; the elector palatine was his steward, Saxony his marshal, Brandenburg his chamberlain, and Bohemia his cupbearer. The archbishop of Mainz was president of the electoral college, and on the death of a king summoned the electors to Frankfurt.

The power of the seven electors was greatly increased by the Golden Bull. They were made almost sovereign rulers, with privileges not enjoyed by the other princes of Germany. They formed a college, one of the three sections of the imperial diet. The com-

position of the college remained unchanged until 1623, when the elector palatine lost his vote, which was given to the duke of Bavaria. In 1648 he was restored as an eighth elector. A ninth electorate was created in 1708 for the ruler of Hanover, and this was held by George I and other English kings. To keep up the old theory these new electors also held offices, the elector palatine being treasurer and Hanover standard-bearer. In 1778 the ruling family of Bavaria became extinct, and the elector palatine secured its lands, thus uniting two votes. In 1806, with the dissolution of the empire, the electors ceased to exist. (*See* Empire; Germany; Golden Bull.)

(2) In the U.S.A., persons chosen by popular vote to elect the president. In Nov. of every fourth (leap) year, voters throughout the U.S.A. go to the polls to choose the electors whose sole task it will be to give their votes at their respective state capitals in Dec for the presidential candidate approved by their party. Each state chooses as many electors as it sends senators and representatives to congress. Theoretically, an elector is left free to vote for the candidate whom he honestly thinks is the best man; but in practice it is inconceivable that a Democratic elector could vote for a Republican candidate, or vice versa. Whatever the balance of votes in the electoral college of any one state, the whole quota of that state's votes is cast in favour of the candidate chosen by the majority of electors. The vice-president of the U.S.A. is elected by similar machinery.

**Electra.** In Greek mythology, daughter of Agamemnon and Clytemnestra. She incited her brother Orestes, when he grew up to manhood, to murder his mother, Clytemnestra, in revenge for the latter's murder of his father on his return from Troy. The tragic life of Electra forms the subject of tragedies by Sophocles and by Euripides. *See* Agamemnon; Clytemnestra; Orestes.

**Electrical Engineers, INSTITUTION OF.** British organization founded as The Society of Telegraph Engineers in 1871. Its name was afterwards changed to The Society of Telegraph Engineers and Electricians, and finally, in 1889, to its present designation. It was incorporated by royal charter in 1921. The institution has many local centres and sub-centres in Great Britain and N. Ireland, and branches in Eire, Argentina,



China, Calcutta, and Ceylon. London address, Savoy Place, W.C.2.

**Electrical Units.** Units used to indicate the values of electric pressure, the volt; current intensity, the ampere; resistance, the ohm; and power, the watt. Each of these units is described under its own heading. See also International Units; Ohm's Law.

**Electric Arc.** A luminous discharge of electricity through a conducting medium such as air or gas which is in a state of ionisation (*q.v.*), thus rendering it temporarily conducting; or such a discharge in a conducting medium formed by a bridge of minute particles of its own electrodes heated to incandescence. Examples of the former are seen in the luminous discharges in fluorescent lamps, where the arc is conducted by ionised atoms of mercury, sodium, or other vapour at a low pressure. The best-known example of the second type is the ordinary carbon arc lamp.

An arc once established can be maintained by a difference of potential between electrodes of as little as 30 volts, and should not be confused with an electric spark, which actually jumps or breaks down a gap between two electrodes and requires several thousand volts to break down a gap as short as a millimetre. Arcs may be desirable phenomena or quite the reverse. In the carbon arc lamp used in cinematography, in the arc furnace for melting metals, and in the arc type of electric welding (*q.v.*), the production and maintenance of the arc are the primary object. In switching operations, the arc is highly undesirable because of its extremely high temperatures and consequent destructive effect.

**Electric Charge.** Term used for certain states of electrification of a body. When two substances (insulated if conductors) are pressed hard or rubbed together and then drawn apart, they are found to have developed properties which they did not apparently possess before, the most striking being the power of attracting each other and light particles of other substances. They have developed or acquired an electric charge and are said to be electrified.

All bodies seem able to develop or acquire such a charge more or less, but if different substances so charged be examined the remarkable fact emerges that, while the charges have certain properties in common and act in accordance with the same laws, there are two

different kinds, one kind being developed by certain classes of substances and the other by other classes, with this qualification, that either kind may be developed on some substances according to the material with which they are rubbed. The two kinds of charge are represented by that developed on a glass rod when rubbed with silk, and by that produced on a stick of resin when rubbed with fur or wool, the former has received the name of positive electricity and the latter that of negative electricity. Another remarkable characteristic of these charges is that one is never developed by itself but both are always produced at the same time, one kind being found on the body rubbed and the other kind on the material with which it is rubbed. See Electricity.

**Electric Discharge.** Literally, an escape of electricity from a charged conductor; but in practice the term is limited to a discharge that travels through a gas at normal or rarefied pressures. The earliest discharges were those passing through or into the atmosphere; *e.g.* from an electrified cloud, or from the metal cylinder of an electrical machine, two versions of the same phenomenon differing only in scale. Three types of discharge are recognized in both instances:

(1) Spark discharge, or lightning in the natural example. This is a sudden release of energy between oppositely charged conductors caused by the breakdown of the insulating air between them.

(2) Brush discharge, a short bright streak coming from the positive electrode and splitting up into many branches, which grow fainter as they leave the parent stem until they finally disappear in air. It occurs when the voltage is less than sufficient to spark.

(3) Glow discharge, or corona, observed when the diameter of a conductor or part of it is so small relatively to the voltage of the charge that the air in contact with the surface continuously breaks down; the discharge resembling a thin coating of luminous fur.

To these must be added the fourth type of discharge which passes through a rarefied gas, consisting of a stream of electrons and seen in nature as the aurora. When it occurs in a vacuum tube which is being exhausted, a continuous band of light first appears between the electrodes, produced by frequent collisions between the electrons and the remaining gas molecules, and known as the positive

column. At lower pressure this breaks up into striæ, and disappears at about a millionth of an atmosphere. The electron discharge has now become invisible, but causes the glass to fluoresce. So-called fluorescent lamps are a practical application of this principle. See Electronics; Gas-Discharge Tube; Neon Lamp.

**Electric Fish.** Group of fishes possessing the power of administering an electric shock. There are three kinds, these being, in the order of their electrical strength, the electric eel (see Eel, Electric), the African catfish, and the torpedo, a species of ray.

The electric catfish (*Malapterurus electricus*) is found in all the larger rivers of Africa, the finest and most powerful occurring in the Nile. It frequents the darker and more sluggish portions of the streams, where it kills or stuns other fish, which it eats. It is found up to four feet in length. In some catfish the electrical power seems present all over the body, in others just under the skin at each side.

The torpedo or electric ray is the most numerous of these fish. A considerable number of species occur in the warmer seas of the world, at least two near the southern shores of the U.S.A. The best known is the *Torpedo marmorata* of the southern shores of Europe and of the Mediterranean; large specimens may weigh 80 lb.

The muscles and the nerves concerned in the exercise of the electrical power of these fish are known; but the source of the power and how the organisms become charged with it is not known. Its exercise evidently calls for much nervous force, as after a powerful shock or a series of shocks has been given the fish is exhausted, and must have rest.

**Electric Furnace.** A furnace heated by electric power. Davy may be said to have used the first electric furnace in the production of metallic sodium and potassium. In 1839 Hare made graphite and calcium in a small electric furnace. But not until there was available an abundance of electrical power were such furnaces practicable in industry. Localisation of heat, lack of fumes, shortened times for heating, fewer heat losses, and high temperatures, limited only by fusing of the furnace refractories, are among the many advantages. But it is essential to have sources of cheap electrical power. The electrical energy is used wholly for heating except in electrolysis of fused salts. Small laboratory

furnaces are usually heated by resistance, but this method is not economical on the large scale. The material itself may act as the conductor and its own resistance will cause the heating. More commonly a conductor of high resistance is built into the furnace and the charge is heated indirectly. Tube furnaces with a platinum or nickel chrome wire wound round the tube are used for analytical and laboratory work. Silicon carbide rods can be used as resistors.

#### Furnaces for Alloy Steel

Large electric furnaces used for alloy steel manufacture are usually of the arc type. These depend on the following principle: if two electrodes are brought into contact, current begins to flow; if the electrodes are then moved slowly apart, the current continues to flow across the gap, being carried by vapour, volatilised from the heated tips of the electrodes. If the distance becomes too great the current no longer flows. Carbon, which volatilises at about 3,500°C., is commonly used for electrodes. Alternating current is used and furnaces have been designed for single-, two-, or three-phase operation. Indirect arc furnaces have electrodes through the sides, the charge being heated by radiation.

For non-ferrous melting some furnaces similar to those used for steel are often employed in Europe. The rocking arc furnace, in which an arc is struck between two electrodes inserted through the ends of the furnace, which is rocked continually, is common in America.

The most suitable, however, are low- and high-frequency induction furnaces. Brass is melted for the rolling mills in a low-frequency furnace of the Ajax-Wyatt type, which operates on the transformer principle. A primary coil is inserted in the bottom of the furnace and molten metal is run into a channel round it to form the secondary coil. The top of this ring is open into the body of the furnace and when the current passes it becomes rapidly heated, the hot metal circulating into the cold charge. High frequency furnaces employ comparatively weak magnetic fields at frequencies between 500 and 2,000 cycles per second or higher. The iron core can be dispensed with and the body of the melt is itself the secondary. If the melt is a non-conductor, a conducting crucible is used. The induced current gives efficient and rapid heating and the field of application is wide. These furnaces are also used for special steels.

## ELECTRICITY: GENERAL INTRODUCTION

S. G. Blaxland Stubbs, Gen. Ed. The Electrical Encyclopedia, and A. J. Drummond, F.R.Met.S.

*This article is presented as an introduction to a vast subject of ever increasing importance in industrial, scientific, and domestic life. It is followed by a group of articles on varied special applications of electricity. Many others are distributed throughout the work under such headings as Alternator; Battery; Current; Dynamo; Radio; Transformer, etc.*

Electricity (from Gr. *elektron*, amber) has been known to man since Thales of Miletus (c. 600 B.C.) noted that amber, jet, and a few other substances, when rubbed, attracted to them other light objects, such as dry leaves, straw, or feathers. They were, in fact, electrified.

The first experimental researches were made by Dr. William Gilbert of Colchester (1544-1603), physician to Queen Elizabeth. He made detailed studies of the property of attracting light substances which certain materials acquire after being rubbed with silk, dry flannel, etc. He applied the term "electric" to this property, and first showed that the earth itself is a magnet.

From Gilbert's day to the mid-18th century the researches of English, German, and French scientists and experimenters established the main facts of static electricity, as it was called. Otto von Guericke, of Magdeburg, invented the first electric "machine," in which sulphur balls mounted on a shaft, rotated and rubbed by the operator's hand, produced electric sparks. Stephen Gray showed that some substances conduct electricity while others do not; and in France, C. F. de C. Du Fay distinguished between positive and negative charges, believing that they were due to two different kinds of electricity. An excess of positive was "vitreous" fluid, producing positive electrification, and an excess of negative was "resinous" fluid, producing negative electrification; equal amounts resulted in neutrality.

#### The Leyden Jar

Sir William Watson in the mid-18th century and Dr. John Bevis made the Leyden jar, still to be seen in classroom and laboratory demonstrations. It was a glass jar, coated inside and outside with tinfoil, which could be given a heavy electric charge on the inner coating, the outer coating being then oppositely charged. This had been conceived in its simplest form by Kleist and Musschenbroek, of Leyden. Watson showed that gunpowder can

be exploded by a spark from the jar, and found that electricity travelled apparently instantaneously from one end to the other of a 2-mile wire.

Thirteen years after the death of Du Fay, Benjamin Franklin carried out in 1752 his demonstration of the identity of lightning with the electric spark. He and Kinnersley, in America, also postulated the dual quality of electricity; and Franklin's terminology was ultimately adopted, referring to bodies as positively or negatively electrified. Franklin, however, maintained the one-fluid theory of electricity, considering that all bodies possessed a normal amount of electric fluid, positive being an excess and negative a deficiency of this amount. This theory held the field almost undisputed until Sir J. J. Thomson, nearly 150 years later, demonstrated by the electron theory that negative and positive are two separate kinds (electrons and protons).

#### Coulomb's and Ohm's Laws

Later in the 18th century the mathematical theory of electricity began to be developed by Coulomb in France and Cavendish in England. Coulomb's law, that the force of electric attraction between bodies varies inversely as the square of the distance, was in fact discovered first by Cavendish; the latter also anticipated by nearly 50 years the fundamental law of flow of electric current now known as Ohm's law. G. S. Ohm published between 1825 and 1830 the results of his investigations on the connexion between the strength of a current in a conducting wire and electro-motive force. At the beginning of the 19th century a major discovery was made by Alessandro Volta, of Pavia. He showed that an electric current can be produced from a series of zinc and copper plates separated by cloths moistened with acid or salt if the first pair be joined to the last pair by a wire. This was the first electric primary battery; and the basic principle remains unchanged. It was called the Voltaic pile, or sometimes the galvanic cell, from Luigi Galvani's previous experiments in animal electricity.

The unit of electric pressure (volt) was given Volta's name.

Another big step was made by Hans Oersted of Copenhagen, who discovered in 1830 that a magnetic needle was deflected by an electric current, thus confirming the relation hitherto only suspected between magnetism and electricity. André Ampère (whose name was later given to the unit of quantity of current) extended Oersted's work, and with D. F. Arago worked out the fundamental laws of electrodynamics.

In 1831 Michael Faraday discovered the principle of electromagnetic induction, *i.e.* the production of electric currents by variations in electric field strength and of magnetism by current changes. He also discovered self induction and the transmission of electric forces through a theoretical medium, instead of the old "action at a distance" concept. Faraday's work made possible the electric motor, dynamo, and alternator, and all machines and instruments depending upon electro-magnetic induction. Upon Faraday's fundamental conception the whole vast edifice of electrical engineering is based.

Faraday's theory of the transmission of electric force was developed by James Clerk-Maxwell on a mathematical basis. He not only showed that light, heat, and electric waves were similar in nature, but predicted the transmission of electric waves through space. Rudolf Hertz of Karlsruhe in 1888 generated and detected such electro-magnetic waves, a work that was brought to fruition in the beginnings of wireless by Lodge and Marconi.

#### Discovery of the Electron

Sir J. J. Thomson, experimenting on discharges in vacuum (cathode ray) tubes, demonstrated in 1897 the existence of the ultimate particles of electricity now known as electrons. He measured their mass and determined their charge. Then by postulating the existence of the positive nucleus he led to the fundamental discoveries of the structure of the atom which, through the work of Kelvin, Crookes, Curie, Rutherford, Soddy, etc., led to the splitting of the atom and the release of atomic energy.

Among inventors, as distinct from physicists and experimenters, should be mentioned Humphry Davy (arc lamp), Alexander Bell (telephone), Edison and Swan (with others, electric light), Gramme (dynamo), Tesla (induction motor), and Röntgen (X-rays).

**MODERN DEVELOPMENTS**  
Electricity is a form of energy, probably fundamental, due according to accepted theory to the movements of particles (*i.e.* free electrons). On this theory electricity, electro-magnetism, and magnetism are basically similar in nature and interdependent in action.

The electron theory supplies the most satisfactory explanation of the bulk of electrical phenomena, and an acquaintance with it assists in the grasp of everyday terms and conceptions. Briefly, the atom is supposed to consist of a central nucleus of positive electrification (proton) surrounded by varying numbers of negatively electrified particles (electrons) moving in orbits. In a solid body, such as one which is said to conduct electricity, some of the electrons are sufficiently free of their atoms to move about in the spaces between the atoms. If these free, or loose, electrons move in one direction an electric current is produced in the conductor.

#### The Flow of Electricity

For practical purposes we are concerned therefore with streams of these particles of electricity, and we can speak accordingly of a flow of electricity (or current), and to that extent regard electricity as a fluid. A body is electrically charged when it has either less than its normal quantity of negative particles or more. It then has a tendency to revert to the neutral (or uncharged) condition by yielding or receiving electricity to or from a neighbouring body. Thus we get a flow (or current) of electricity. Electric currents are said to be negative or positive, according to direction of flow.

Electro-magnets in motion produce electric currents (dynamos and alternators); and electric currents in motion produce magnetic power (electric motors). Electric currents are also generated by heat applied to certain pairs of dissimilar metals (thermo-couples).

Electric actions are reversible: as magnetic action produces electric currents and vice versa, so electric currents produce chemical action (electrolysis) and vice versa.

**CONDUCTORS.** A current of electricity, like one of water, must have a definite channel along which to flow, this channel being its conductor. Materials vary widely in their capacity to convey electric currents, some having high conductivity, like silver, copper, aluminium, iron. Other materials have lesser degrees of conductivity, and those over which elec-

trification spreads extremely slowly are described as non-conductors or insulators. Water and all metals are conductors, while gases, glass, shellac, india-rubber, silk, wool, and sulphur are non-conductors. Living organisms are conductors, since all contain watery fluids. A material is a non-conductor in proportion to the amount of resistance it offers to electric flow, and this resistance is measured in ohms. In general, resistance increases with temperature.

Straying or leaking current is dangerous to human life and property. The insulation must be guarded from damage by various forms of covering (*see* Cable). Circuits must be further protected by automatic arrangements to cut off the current if it rises to dangerous levels, causing risk of fire and explosive effects.

Certain lead and tin alloys are used in domestic circuits as fuses; they are short lengths of wire which will melt quickly and break (or open) the circuit when the current in it increases to a point near the limit of the capacity of the conductor or cable. On larger circuits, switches (called circuit breakers) designed to open instantaneously on abnormal current rises serve the same purpose.

Some conducting materials conduct better in one direction than the other, and this phenomenon is applied to the rectification of alternating currents.

**THE CIRCUIT.** An electric current will flow if its path forms a complete circuit from and back to the generator, whether the generator is a battery or a dynamo. Every piece of apparatus, lamp, bell, motor, etc., served is included within the circuit in one of two ways—either in series or in parallel. If in series the current travels in a direct path through each piece of apparatus; if the apparatus is connected to the circuit in such a way that each piece has its own sub-circuit, it is said to be in parallel. A circuit is said to be closed if no gap exists, and when continuity is broken the circuit is said to be open. When open, as by opening a switch, no current can flow. The earth may be used as part of a circuit as in some electric traction systems.

#### The Volt and the Ampere

The flow of a current must be forced around a circuit by some sort of pressure. The unit by which this pressure is measured is the volt, and the unit by which the amount of current is measured is the ampere.

When the motion of the negative electron as distinct from a positive charge is considered, current flow is said to be from the negative to the positive. Potential difference between two charged bodies forces the electric current to flow from the higher to the lower in just the same way as heat flows from a hot body to a colder one; and if there is no difference in the potential of the two charges there can be no flow.

**D.C. AND A.C.** Current is generated and transmitted as direct or continuous (D.C., or more correctly C.C.) or alternating (A.C.), the first from dynamos (*q.v.*) and the second from alternators (*q.v.*), or A.C. generators.

In earlier days the first form was usually employed, but as A.C. is more readily and efficiently generated and transmitted at high voltages, and can be transformed without moving machinery down from high to low voltages for domestic and industrial purposes, it has in most countries come into general use. In Great Britain a central grid system interconnects the power (generating) stations and distributing centres of all "authorised undertakers" of electricity supply. Current is largely transmitted at 132,000 volts (132 kV), and also at 66,000 and 33,000 volts in ten districts, being transformed down at sub-stations for local use. Up to the passing of the Act of 1947 nationalising the generation and transmission of electric power in Great Britain, domestic supplies were in general standardised at 230 volts, with a frequency of 50 cycles, though in some districts other voltages (such as 100, 240, and 400) were used, with varying frequencies such as 25, 60, or 100 cycles. Standardisation at 240 volts was part of the plan under nationalisation. In the City of London and a few other centres D.C. was still used.

#### Cycles of Frequency

The cycle of frequency refers to the period of time taken by an alternating current (*q.v.*) to flow in one direction from the generator through the circuit back to the generator. In an alternating current generator the direction of the current flow changes so many times per second, according to the type of generator. Standard current flows in one direction for  $\frac{1}{50}$  sec. and then reverses (*i.e.* 50 cycles per second). Since electricity flows at the speed of light (186,000 miles per sec.), this alternation is, for practical purposes, instantaneous in all working

circuits. The frequency of radio waves varies from thousands of cycles per sec. to millions of cycles per sec.

**DANGERS FROM ELECTRICITY.** Shocks which may be very serious, even fatal, may be received from ordinary house supplies, if electricity is wrongly handled, but it is safe if correct methods are used. If a man touches an electrified material and at the same time is in contact with another conductor, the current will pass through his body, since his body then forms part of the closed circuit. But if he touches an electrified material and no part of his body is in contact with a second conductor the circuit is open and current cannot flow.

#### Current Versus Resistance

The fact that current flows because of a potential difference between two charged bodies—and the greater the difference the greater the current—could be expressed by saying that the amount of current passing through a circuit at a given moment depends on the force generated (or voltage of the current) and on the resistance of the conductors. If a house circuit at 230 volts is short-circuited to earth through a good conductor such as a water pipe, the current encounters negligible resistance and the P.D. is from 230 to zero or earth potential, less the small resistance of the pipe, etc. If a man is standing in wet boots on a wet floor he forms part of a very low resistance circuit. If then he touches a live connexion, his body will convey the full voltage and full amperage, and even in a 230-volt circuit such a shock has proved fatal, since the current may easily rise to 50 or 100 amperes.

If, on the other hand, he is standing in dry boots on a dry carpet and he touches the live connexion, it is probable that only a part of the current will pass through his body, since the dry boots and dry carpet being of high resistance allow a much smaller amount of current (*i.e.* amperage) to pass. If he were in rubber boots or standing on a dry rubber mat he would receive no shock, since rubber is a non-conductor and there would be no P.D. The rubber acts in the same way as an open switch in breaking the circuit.

**EARTHING.** As the earth is a good conductor, and is regarded as being at zero potential it would seem that the simplest circuit for larger systems could be formed by allowing the current to return to the generator through the earth;

but if that method were used the current would tend to follow the underground paths which are provided by water pipes, telephone, and other cables. In time the pipes and cables would suffer from destructive electrolytic action; stray earth currents cause such action in everyday practice. However, earth is used as a safety device. If through faulty insulation parts of a structure become electrified they will be a source of danger unless properly earthed.

S. G. Blaxland Stubbs

**ATMOSPHERIC ELECTRICITY.** Although early investigators believed that lightning and the electrical discharge were related, it was not until the middle of the 18th century that Benjamin Franklin showed their close connexion by his famous experiment of drawing electricity from the wire of a kite. This was possible owing to the large difference of electrical potential between the ground and the air at the level of the kite. The electrical manifestations of the atmosphere are most spectacular in the form of a thunderstorm; but even on the calmest days the atmosphere is always electrically charged. The earth is not an electrically neutral body; it is charged negatively, and in undisturbed conditions the charge in the air is positive. As we rise above the earth, the potential increases to the extent of about 150 volts per metre of height in the lower layers of the atmosphere. This gradient diminishes with altitude, but the actual potential goes on increasing, and at the levels attained by aircraft it may be hundreds of thousands of volts. Hence the "sparking" danger to tethered balloons flying at levels where the difference between the potential of the balloon (*i.e.* earth) and the atmosphere is great.

#### The Potential Gradient

The change of electrical pressure or potential per metre is called the potential gradient, which is thus representative of the strength of the electric field. Near the ground the potential gradient is measured by exposing a collector connected to a suitable electrometer. This collector may take the form of an insulated wire carrying a burning fuse or a radio-active agent, which increases the conductivity of the air, making it possible for the potential at any instant to be picked up by the wire and transferred to the electrometer where the voltage acquired can be read. In fine weather the higher potential is at the greater height and

the gradient is said to be positive. The gradient shows regular changes throughout the day and throughout the year. At many places on land there are two maxima and two minima during the 24 hours; over the oceans there is only one maximum and one minimum. The former variation is with local time and is related to the smoke pollution from large towns, while the latter is one of universal time and has been shown to be in phase with the diurnal variation of thunderstorm activity over the earth.

Fog or smoke increases the value of the normal gradient; high negative fields are produced in dust storms; rain or thunderstorms can cause great fluctuations. When the electric field is strong an electric glow or brush discharge takes place from pointed conductors placed in the field. Under favourable conditions, the glow discharge from mountain peaks or masts of ships, exposed to the intense fields of a thundercloud, may become very conspicuous (St. Elmo's fire). Point discharge currents play an important rôle in the interchange of electricity between the atmosphere and the earth.

#### Electrification of Air and Rain

Air conducts electricity because of the presence of small carriers of positive and negative electricity called ions; and in fine weather positive electricity flows from the higher electrical levels down to the ground. When the potential gradient is negative the downward flowing current is also negative.

Raindrops are usually electrified, sometimes negatively and sometimes positively. The principal cause of the electrification of rain is probably the breaking up of large drops into smaller ones by powerful upward currents of air, the drops and the air receiving opposite kinds of charge. This theory has been put forward to account for the origin and distribution of electrical charges in thunderclouds. Recent experimental work supports the belief that thunderstorms conduct positive electricity into upper conducting levels (ionosphere) which would act to transfer it from one part of the world to another and so maintain the normal electric field.

A. J. Drummond

#### Electricity Commissioners.

Panel of experts appointed by the minister of Transport, 1919. Their duties were to promote, regulate, and supervise electricity supply (i.e. to coordinate the industry to ensure plentiful and cheap electricity); issue regulations for the

safety of the public; approve types of electricity meters, and test and examine them. They had no direct governmental authority, but could advise the government on the proper course to be taken in all questions relating to electricity. The cost of the commission was borne by the industry, and not by the taxpayer. The commission came under the ministry of Fuel and Power, 1942, and was abolished by the Nationalization Act, 1947.

**Electricity Supply.** Although isolated installations were in operation a decade earlier, public electricity supply may be said to date from about 1881, when the incandescent lamp became a commercial proposition. Legislation of the period placed the new industry in the hands of private enterprise, while allowing for future (compulsory) purchase by municipal authorities where this appeared desirable. A number of companies were so taken over, but, under the control of the Board of Trade, both types of undertaking—municipal and company—developed independently. In 1919

the Electricity Commissioners were created as an authority charged with the promotion, regulation, and supervision of electricity supply, and were responsible to the ministry of Transport (from 1942 to the ministry of Fuel and Power).

The position early in 1947 was that, although wholesale distribution was in the hands of the Central Electricity Board (see *Electric Power*; *Grid*), created by an Act in 1926, retail distribution was carried out by 370 municipal authorities and 190 supply companies, each having its own area and its own system of tariff charges. Often different voltages were worked, although much had been done towards standardisation of both voltages and tariffs. By an Act of 1947, control of the entire structure of the industry—generation and both wholesale and retail distribution—was vested in the minister of Fuel and Power, via an electricity authority, operating through 14 area electricity boards, both the C.E.B. and the commissioners being abolished.

## ELECTRIC POWER AND ITS USES

E. B. Watton, A.M.I.E.E., Asst. Editor, *Electrical Industries*

*This article outlines the general principles of the generation, transmission, distribution, and use of electric power. For basic electrical principles see Electricity; Electro-magnetic Machines. See also Coal · Fuel; Lighting; Locomotive; Motor, etc.*

It is not an exaggeration to say that without electricity the civilized world as we know it could not exist. The machine age depends for its very life-blood on cheap power, easily available, and there is no form of power more easily distributed and utilised than electricity.

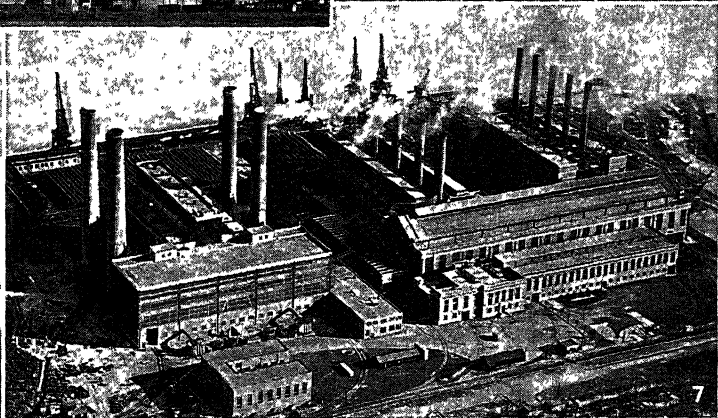
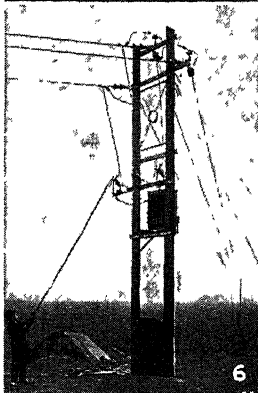
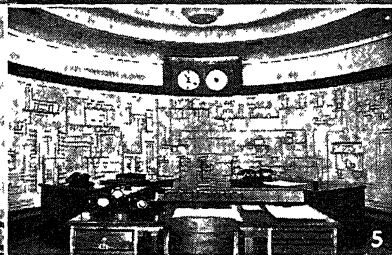
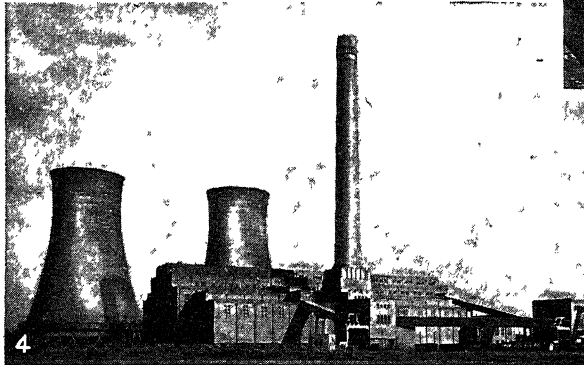
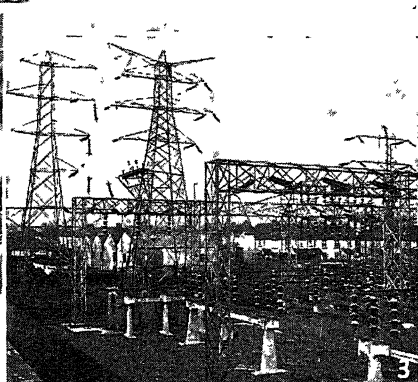
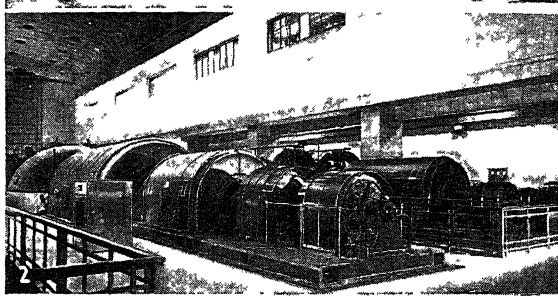
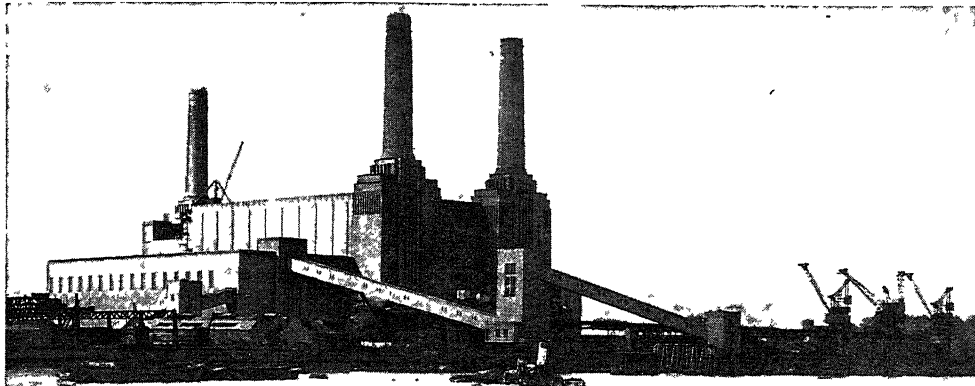
At one time, if a man wished to start a factory, he had to build it near a coal producing region to obtain reasonable economy. He had to instal a steam engine, with its attendant boilers, condensers, chimneys, and special buildings: provide staff to operate it; transmit the power produced to remote parts of his factory by pulleys and belts or ropes, which took up valuable space, made the planning of factory lay-out difficult, and wasted, in themselves, a considerable amount of the power generated. If he started in a modest way he had either to use an engine much too big or be faced with the prospect of scrapping his engine and installing a new one when business expanded.

In the present age, he builds his factory wherever electric power is available—which means virtually anywhere. Each machine

he instals has its own built-in motor, just large enough for its actual requirements, with no power wasted. When the machine is stopped, there is no fuel wasted by keeping up fires in boilers. The chief advantage is, of course, the facility with which electric power can be generated economically on a large scale, in power stations, transmitted over long distances, and easily reconverted into most other forms of power required.

**GENERATION.** A little water power is used in Great Britain (notably in Scotland) and to a much larger extent abroad; particularly in the U.S.A., where colossal power schemes exist, such as Niagara Falls, Boulder Dam, and in the Tennessee Valley. (See *Hydro-electric Installations*.) In the U.K., however, the main source of supply is from coal, the energy of which is converted into electrical energy by the steam turbine. Where, for any reason, coal is not available, oil, or another fuel can be used instead.

In selecting the site for a power station, there are three main considerations: (1) Distance from load. Though electricity can be transmitted over any distance,



1. Battersea power station on R Thames after completion of "B" section, 1941; total output 343,000 kW.  
2. Turbo-generators (100,000 kW.) at Battersea "B."  
3. Grid sub-station, Brighton, showing pylons and switching gear. 4. Hams Hall, Birmingham, 300,000 kW.,

with cooling towers. 5. National and area control room of central British electricity authority, London. 6. Rural 11,000 v. transmission line with pole-mounted transformer and cut-out switch. 7. Thames-side station, Barking, 300,000 kW. (ultimate capacity 500,000 kW.)

# **ELECTRIC POWER: GENERATION AND TRANSMISSION TO HOMES AND INDUSTRY** *Photos. Electrical Review; British Thomson-Houston, Ltd.; Associated Press; Topical*



there are limitations on economic grounds (*v.i.*, under Transmission).

(2) Availability of fuel. Power stations must be sited where the supply of coal or other fuel is easy by rail or water—preferably the latter; for a station may use upwards of 2,000 tons of coal per day. (3) Availability of water. The steam turbine, to be efficient, must run “condensing,” *i.e.* the exhaust steam must be reconverted into water in a condenser, which requires a large supply of cooling water. A convenient method is to build the station on the banks of a river, where a system of large culverts, fitted with screens or strainers, can take several million gallons per hour from the river and return it, after use, by another system of culverts to a point farther downstream. If this is not possible, and there is no river near, the hot water from the condensers must be dealt with by cooling towers, in which the water is discharged in a fine spray from a point high up in the tower, dropping like rain into a pond below, being cooled in its journey by the rising air currents created by the chimney-like structure.

The boilers used are invariably of the water-tube type, in which the water is contained in banks of tubes arranged so as to be surrounded by the hot gases from the furnace. A modern boiler may work with steam pressures of the order of 1,000 lb. per sq. in.

The hot gases, having done their work, are led away to the chimneys by dust and grit catchers, which remove particles likely to cause pollution to the atmosphere.

#### From Steam into Electrical Energy

The steam turbo-alternators which convert the energy of the steam into electrical energy have grown during the last three decades to ten times their former size, and 60,000 kilowatts in a single unit is common. They run usually at a speed of 3,000 r.p.m. and generate alternating current at a frequency of 50 cycles per second. A common voltage is 11,000, but direct generation at 33,000 volts is steadily on the increase. Alternating current is invariably used owing to the facility with which it can be generated at high voltage and changed from one voltage to another by transformers (*q.v.*). The electricity generated is fed, through switchgear provided with the most delicate protective devices to guard against faults in

any part of the apparatus, into transformers which step up the voltage to an appropriate value for transmission to the load or distribution centre.

**TRANSMISSION.** To comprehend the economics of electric power transmission, it is necessary to have some understanding of the difference between current and voltage. Consider an electrical conductor as a pipe through which water flows. The electrical voltage is analogous to the pressure of the water, the rate of flow of the water is comparable with the current measured in amperes, and the area of the pipe may be considered to correspond to the electrical resistance of the conductor. Some friction in the pipe will cause a loss of power, which will be dependent on the rate of flow; but, if the pressure be kept high and the rate of flow low, the loss will be small in proportion to the total power transmitted, which is dependent upon pressure and rate of flow.

#### Increase in Transmission Voltages

This holds good with electricity: the higher the pressure, and the lower the current, the lower will be the percentage losses for a given conductor size. For a given amount of loss, the conductor may be made smaller, so saving in actual conductor material. On the other hand, the cost of switchgear and other apparatus increases with the voltage, although not in direct proportion. For long distances, the highest voltages commercially possible should be used. Transmission voltages have risen in a most spectacular manner from the 1,100 volts of the early A.C. stations, to 11,000, 33,000, 66,000, 132,000, and even higher. The Boulder Dam scheme operates at 220,000 volts. It is believed that 500,000 volts may represent nearly the maximum, owing to corona—a bluish flame-like discharge which forms around high-voltage conductors, causing electricity literally to leak off into the ionised air (*see Electric Discharge*).

**THE GRID.** The British grid is one of the finest examples in the world of a carefully planned and closely knit transmission system, linking more than 120 major power stations with some 4,000 miles of transmission lines serving nearly 300 transformer and switching stations, and rendering power available throughout a network that almost covers the country. The advantages of such a system can hardly be over-estimated. With interconnexion, as opposed

to separate small power systems the amount of spare plant held in each station to cover breakdowns or repair periods can be cut down to a fraction of the former requirements; and, except when the entire output of existing generators is below total needs, a complete breakdown at one power station would not interrupt the supply to consumers. Costs can be reduced by transferring the load from inefficient stations and running the others at their maximum efficiency. Centralised control is possible of plant aggregating some 10,000,000 kilowatts.

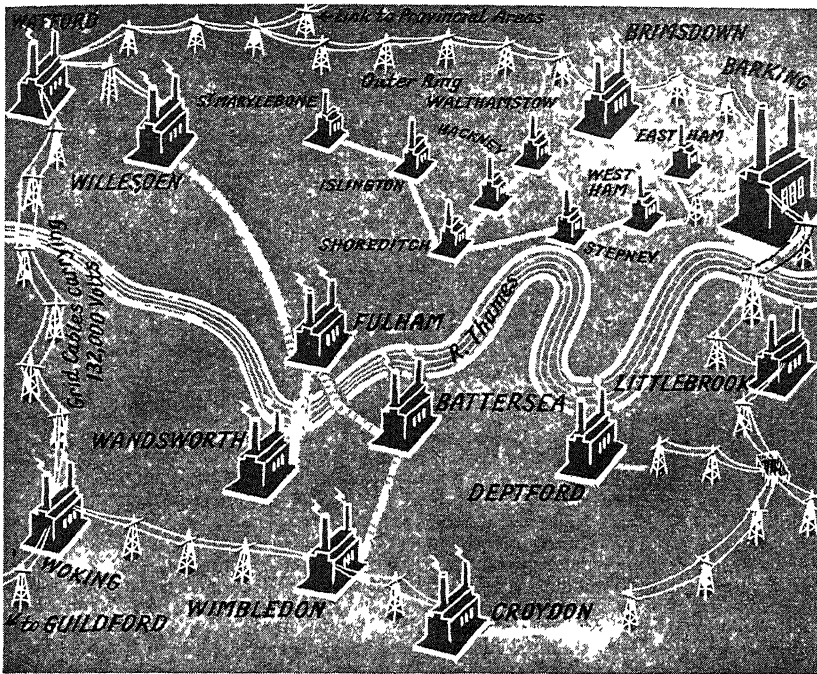
Grid transmission is mostly by overhead conductors on steel towers. In certain congested areas (London cable grid) a considerable amount of power is transmitted by underground cables, but the cost of installation and upkeep of underground cables is very high.

**DISTRIBUTION.** The electricity, as it arrives at the receiving end of the transmission system, is still at high voltage (132,000 or 66,000 with the grid), which is quite unsuitable for any ordinary purposes and must be “stepped down” before being distributed to consumers. The actual details of this depend on the type of district and the type of consumer.

#### Transformers for Reducing Voltage

A grid receiving station contains transformers which step down from 132,000 to 33,000 volts, and distribute to large sub-stations where the electricity is again stepped down to 11,000, 6,600, or 3,300 volts and further distributed to smaller sub-stations. In a town, underground cables operating at 11,000 volts terminate at small brick sub-stations or steel kiosks, containing further transformers to step down to the 240 volts which is the standard distribution voltage for domestic consumers. These small sub-stations are placed at various load centres of the town, and from each radiate the 240-volt feeder cables to strategic points where, in small steel pillars or underground boxes, they are interconnected by fuses to the network of distributor cables running along the streets under the pavements.

From these, at appropriate intervals, is tapped off the service cable entering each house, and terminating in a main switch and supply meter. Factories and other large consumers might be supplied direct at 3,300–11,000 volts, the necessary transformers being located on the premises.



**Electric Power.** Diagram of the London area, explaining how the British grid system links up points of electric current supply. In congested areas power is transmitted by underground cables (shown here by dotted lines), but in the open country overhead cables, on steel towers, are used. The benefits of this system are fully explained in the text.

The photo-electric cell or "electric eye," besides being the basis of the talking film, finds considerable use in industry because of its extreme sensitivity to light and colour and its ability to "watch" without tiring, at high speeds, a whole host of operations. It is used in counting thousands of articles; in complicated colour-matching problems (eliminating human error); in supervision; ensuring that an operator's hands are clear of the danger area in machine presses; giving the alarm at the signs of undue smoke; controlling the position of the printed design on a paper bag, etc.

#### AGRICULTURE.

On the farm, besides

In rural areas, the 11,000-volt supply may be taken by overhead line to a village or other point of supply, and stepped down to 240 volts by a transformer mounted directly on an overhead pole structure, feeding low-voltage overhead feeders slung from wooden poles, from which service connexions are taken directly to the eaves of houses.

**ELECTRIC LIGHTING.** An important use of electricity is in its original application—illumination—where its advantages are so overwhelming that no other source can hope to compete. Its independence of air supply and absence of combustion gases permit its use where any other form of illumination would be impossible; its ease of application makes practicable illumination values undreamed of by any other method; its beauty and convenience cannot be equalled. From the automatic illumination of the inside of a cupboard to the shadowless flood of light on arterial roads, from the tremendous intensity of a searchlight beam to the soft decorative lighting of a restaurant, it is without equal.

**INDUSTRY.** Wherever power is required for a machine, from a watchmaker's lathe or a sewing

machine to the largest steel rolling mill, electric motors will do the work more conveniently than any other form of power. In heavy industry electricity permits the speeding-up of processes not only by its actual rapidity of action, but by its ease of control. A rolling mill with several hundred motors varying from 1 to 5,000 h.p. can have its control centralised in a cabin overlooking the mill and operated by one man. The same power spins thread for artificial silk stockings. Metal is melted in electric furnaces; electric cranes, conveyors, and trucks provide safe and rapid transport; electromagnets remove unwanted iron particles; ingenious testing devices detect cracks or flaws without destruction of materials; special lamps provide infra-red rays to hasten paint-drying processes.

#### Electric Welding

Electric welding (*q.v.*) has revolutionised a great many industrial processes. Castings, particularly heavy ones, have been largely replaced by fabricated structures built up from steel plates and sections by arc welding, saving weight and cost. Spot, or resistance, welding is used in sheet metal work to replace rivets.

running the chaff cutter, mangold slicer, cattle-cake breaker, cream separator, and all the other farm machinery, electricity is used to milk cows, shear sheep, dry grain, pump water, heat soil, and hatch chickens.

**TRANSPORT.** The tram and its younger relation, the trolley-bus, move tremendous numbers of people cheaply and speedily, without polluting crowded streets with poisonous fumes, and without using imported petrol. The electric battery vehicle delivers milk, bread, laundry, etc., and collects refuse. The absence of smoke from electric traction makes it possible to locate railways deep under crowded cities; and the speed of acceleration and braking, the facility with which safety devices can be applied, make it possible to run many more electric than steam trains over a given set of rails. The escalator will move people at least as fast as they can walk, thus eliminating congestion. The electric lift, with its speed, smooth acceleration, automatic control, and multiplicity of safety devices, makes it practicable to live 90 floors above street level. In New York more people are carried in lifts daily than by any other form of transport.

**DOMESTIC.** Though the domestic load is by no means the largest item in the total consumption of electricity it is by far the most widely spread, as electricity is used at least for lighting wherever it is available. Its domestic use for other purposes is rapidly increasing, and includes such applications as space heating, water heating, cooking, washing machines, vacuum cleaners, irons, kettles, toasters, coffee percolators, artificial sun-lamps, radio and television sets, shavers, and clocks.

**Electric Shock.** Term used for the effect on a human being of the passage of an electric current through the body. The passage of an electric current through the human body depends upon the resistance encountered and the voltage applied. Up to 20 milliamperes is usually bearable by most people. From 20 to 50 milliamperes can be dangerous and harmful; above this figure death can be caused. If the current exceeds half an ampere, burning of the tissues may follow. A damp skin increases susceptibility to electric shock, so that persons bathing or washing are more likely to suffer should they touch a live conductor.

Shocks from electricity supply mains and traction systems are frequently dangerous. Above pressures of 100 volts, death may be caused. Alternating current is more lethal than direct current, especially at low frequencies. A shock from public electricity mains is usually more serious because the distribution system has one of its conductors connected to earth. If a person comes into contact with the conductor which is not connected to earth, the current may pass through his whole body, as the victim is usually standing on earth or upon some conducting medium in contact with it which is usually damp enough to conduct electricity. A dry wooden floor, however, is relatively safe.

#### Treatment for Shock

It is generally assumed that death from electric shock is caused by damage to the heart. A shock received through any part of the body which will cause the current to pass through the heart may be fatal. Shocks between the two hands or hands and feet are more dangerous than between the fingers of one hand or from the toe to the heel of one foot.

If the person is unconscious or cannot relax his hold of the live

conductor he should be pulled away from it or isolated by switching off the current or short-circuiting the conductors. When grasping the body, bare or wet hands must not be used. Insulate them with dry clothing or thick paper or other non-conducting material. A wooden stick or piece of dry timber can be used to push or pull the body away from the live conductor. Apply artificial respiration immediately as for cases of drowning; continue even if life seems extinct, at least until medical help can be obtained. Keep the patient warm and wrap up well with hot water bottles or some form of heat at the feet and near the heart. Do not give stimulants except under doctor's orders. Treat burns in the usual way, excluding air from the affected parts.

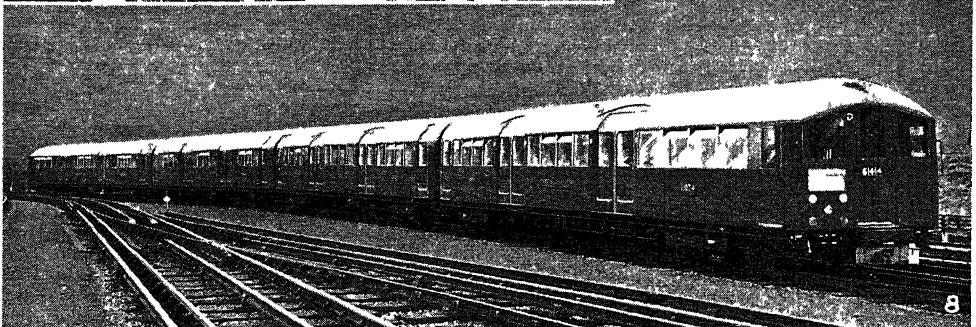
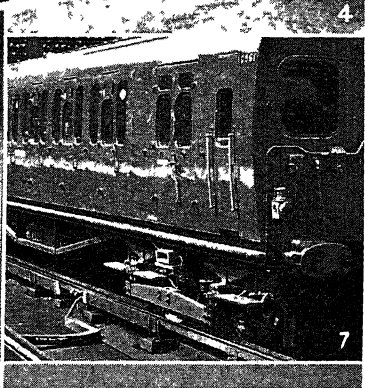
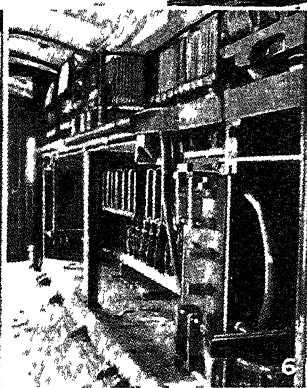
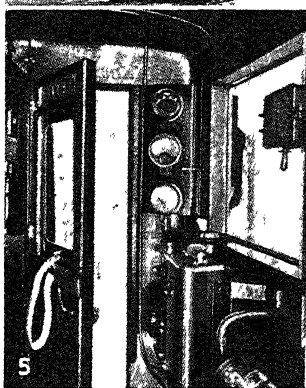
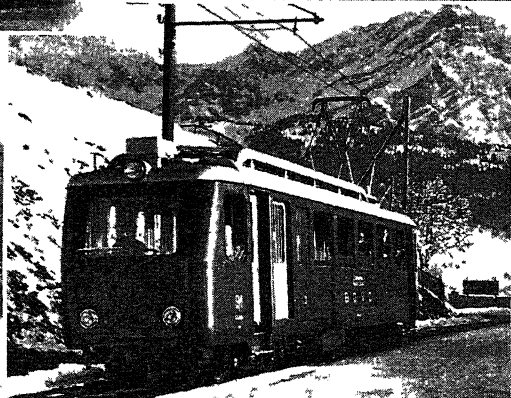
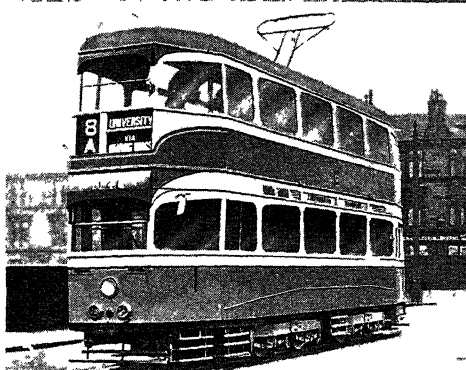
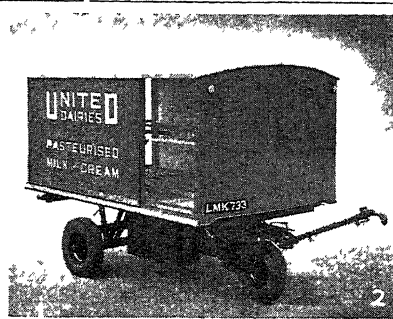
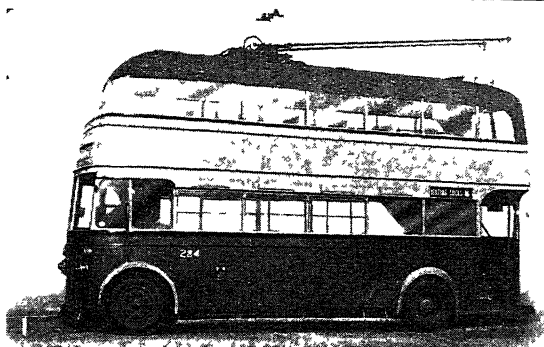
**Electric Steel.** Steel refined in an electric furnace, irrespective of the type of furnace employed or of the refining methods adopted. In refining by electrical methods the principles are essentially the same as those in the open-hearth process, though the practice may be different. Since electricity is costly, the melting of scrap in the electric furnace or the preliminary refining by this means is less economical, so that the furnace is often used only for the final stages of steel production, the procedure then being known as duplexing or triplexing, according to the number of stages in production. Electric steel can be made in either the arc furnace or the induction furnace. The former may be lined with either acid or basic refractories, depending on the degree of refining required and the type of steel to be made.

Basic electric arc furnaces are used for the manufacture of carbon tool steels, alloy structural steels, heat- and corrosion-resisting steels, and tungsten high speed steels, while acid linings are chiefly used when no refining is to be undertaken, as in steel foundries making steel castings. Both acid and basic linings are used for the manufacture of austenitic chrome-nickel steels. For high manganese steels the basic lining is invariably used. For certain other special steels the high frequency induction furnace is preferred to the arc furnace. Induction furnaces overcome any possible tendency to local overheating of the molten metal, as well as providing steel of more uniform composition.

**Electric Traction.** Method of locomotion. Its history dates back more than 100 years. In 1839 a crude electric locomotive, powered by primary batteries, was run on the Edinburgh-Glasgow rly.; but this was not a commercial or technical success, and little is known about it. In 1883 Magnus Volk opened a line half a mile long, raised above Brighton beach; and the same year about 7 m. of track from Giant's Causeway to Portrush was operated electrically. The first electric rly. in the U.K. was the City and South London tube, opened 1890. Locomotives were of 100 h.p. rating, and the maximum speed of trams was about 25 m.p.h. By 1900 this line, the Central London tube rly., and the Liverpool overhead rly. were still the only electric rlys. (as distinct from tramways) in the country, which possessed 1,400-1,500 route miles in 1947.

#### Advantages of Electricity for Railways

The chief advantages of electric traction for railways are: (1) Improved acceleration and braking, combined with automatic signalling, enable a much denser service to be run in safety, particularly where frequent stops are necessary. The steam train, taking so much longer to get up speed, could not possibly handle the suburban transport of London. (2) There is no smoke or fumes; apart from the aesthetic and hygienic aspects, this eliminates a serious disadvantage of coal-steam traction in underground tunnels. (3) There is economy of fuel; power stations burn low grade fuel under conditions of maximum efficiency, while locomotives burn high grade steam coal under conditions of relative inefficiency. Fuel transport, distribution, and stocking are much simplified. In countries where hydro-electric power is available, and good steam coal is not (such as Italy and Switzerland), electric traction is particularly important in the national economy. (4) In hilly country, gradients can be more severe and speeds higher, owing to the relatively large amounts of power available for ascents, and the possibility on descents of using regenerative braking (i.e. loading the train motors as dynamos, and returning power to the system), which prevents waste of energy, wear of brake blocks, and overheating of wheels. (5) Although the first cost of an electric locomotive is usually higher than that of a steam one,



1 Trolley-bus supplied with current by trolley-wheel collector 2 Battery-operated milk delivery pram 3 Tram with overhead sliding contact collector 4 Swiss electric train with bow collector 5 Driver's

cab and, 6 control compartment with fuse boxes and main motor cut out switch, in a main line electric train 7 Shoe collector of a suburban train 8 Coaches and conductor rails of the London Underground rly

# **ELECTRIC TRACTION: COLLECTOR AND CONTROL EQUIPMENT APPLIED TO TRANSPORT**

Photos, British Thomson-Houston, Ltd ; Mickleover Transport, Ltd ; Swiss Federal Railways, British Railways, Fox

the maintenance costs are usually lower. The chief objection to electrification of main rlys. in England is the high first cost. When good steam coal was plentiful and cheap there was little incentive towards the electrification of main lines.

A train may consist of a number of ordinary coaches hauled by an electric locomotive. This is used for main line traffic, where different types of trains are needed. For suburban, tube, and other lines, where traffic is dense and stops are frequent, the multiple unit system of trains with trailer coaches and motor coaches is better. Each coach with motors and controls and collector gear is a complete driving unit in itself, but all are interconnected, so that they operate simultaneously from the driver's compartment in the front coach.

Acceleration is governed by, amongst other things, adhesive weight, i.e. the weight on the driving wheels. If the tractive effort is too great for the friction between wheels and rails, the wheels will slip. (*See Locomotive.*) In the multiple unit system, a far greater proportion of the total weight of the train is utilised as adhesive weight, thus improving the acceleration obtainable.

#### Methods of Current Supply

Current supply to electric rlys., as to tramways, has followed two main methods—from overhead conductor wires, and from surface or buried conductor rails. For the overhead system, in one method a collector bow arranged something like a "lazy-tongs" has contactors which engage with the naked conductor cables; the current is thence taken to the controller and motors. In trams and trolley-buses, trolleys attached by a springy boom to the roof of the vehicle run along the cable and transmit current to the motors. In many old urban tramway systems the conductor is fixed in a conduit arranged between the running rails and well beneath the ground. The tram carries a sliding contactor which passes along a slot in the top of the conduit at ground level. In all these devices the contacting mechanism and conductors are appropriately insulated. Railways may use a single conductor rail which is also laid alongside the running rails on insulators: then there is an earthed return through one of the running rails; or there may be two independent conductor rails alongside the running rails.

**TRAMWAYS.** In Great Britain a dividing line has always been drawn between tramways and rlys. In other countries this is not always so, systems being frequently operated partly as tramways and partly as light rlys. Electric tramways date from about 1884, the first line in England being opened experimentally at Leeds in 1891. They grew in popularity between 1900 and 1910, and in 1925 reached a peak, over 14,000 trams then running in Great Britain. They began to be replaced by trolley-buses, until there were in 1947 fewer than 8,000 trams, while route mileage of trams declined from the peak of 2,700 m. in 1920 to about 1,000 m., part having been replaced by motor buses and part by trolley-buses. One cause of the decline of tramways is the expense involved in track relaying, which is in most districts necessary every 5 to 10 years.

**TROLLEY-BUSES.** The chief advantages possessed by the trolley-bus over the tram are as follows: (a) Mobility and flexibility; a trolley-bus is not forced to disgorge its passengers in the middle of the road and cause traffic congestion, neither does one disabled vehicle block the entire system until it can be removed. (b) The major expense—track—does not arise. (c) Speeds are higher. (d) Passengers enjoy more comfort and silence, on account of the pneumatic tires. On the other hand, the trolley-bus is costlier in upkeep; and it carries fewer passengers.

**DIESEL-ELECTRIC LOCOMOTIVES.** The motive power of these is a Diesel type internal-combustion engine driving a dynamo which feeds the driving motors. This is a complicated arrangement, and its first cost is high, but it is the only practicable method of utilising the Diesel high-power traction, since no internal-combustion engine will produce a heavy torque at low speeds; and change-speed gear-boxes as used in motor vehicles are impracticable for such heavy service. Advantages over the steam locomotive are the complete absence of stand-by losses and instant availability—there are no fires to be lighted and kept banked when not in use. The chief use in Great Britain is for intermittent work such as shunting, but in countries where fuel oil is cheaper than coal the Diesel-electric locomotive would appear to have advantages and is in increasing use.

**STORAGE BATTERY TRACTION.** Locomotives fitted with accumu-

lators have a limited application for underground haulage in mines, and for service over electrified lines during shut-down periods: for construction or track repairs at night, and for breakdown work. Regular train services are hauled by storage battery locomotives on certain railway lines in Eire where a special Drumm battery is used. This battery, which has exceedingly high charging rates, can be partly recharged during a halt at stations, the power being obtained from the Irish grid. With this exception, storage battery traction on rlys. has made no great headway.

**BATTERY-PROPELLED ROAD VEHICLES.** These are ideally suited to urban delivery service where short hauls and frequent stops are the rule. They have low operating costs, being normally recharged at night when electricity rates are usually cheaper than by day. The average run per charge is 45–50 miles. Above this range they cannot be considered as present a serious rival to the petrol vehicle. Small battery-propelled trucks transport luggage at rly. stations and convey materials in factories; they often haul a train of trolleys. Their silence and absence of poisonous exhaust fumes are important in enclosed premises. Recent developments have produced various types of electrically propelled prams for delivery of milk, etc. These have no driver's accommodation, being designed merely to operate at walking pace and relieve the delivery man of the manual effort of pushing a heavy weight.

**Electric Wave.** This is a loose and unscientific term for electromagnetic wave (q.v.).

**Electric Welding.** The joining of metals by welding in which the necessary heat is generated electrically. Three main processes in use are shielded metal arc welding; spot welding; and flash butt welding. In the first, heat is generated by an electric arc struck between the place at which the weld is to be deposited and the end of the rod or wire from which the metal required to fill the joint is to be melted. The joint is made progressively with layers of weld metal. A coating of flux surrounds the filler wire and melts in step with it to assist the fusion of the molten filler metal with the molten parent metal. There are several variations of the arc process, such as carbon arc welding, in which the arc is struck between the work and a carbon electrode whilst a



separate filler rod is melted in as required. Flux is applied to the joint faces, separately, before welding. Argon arc welding (applied widely to magnesium alloys) is a similar process which uses an arc struck between a tungsten electrode and the metal which is to be welded, whilst a stream of inert argon gas is maintained round the arc to protect the hot and molten metal from atmospheric attack, thus doing away with the need for a flux. A separate filler rod can be melted in as required.

#### Spot and Flash Butt Welding

Spot welding makes use of the relatively high electrical resistance between the contacting faces of two overlapping sheets of metal held in intimate contact. Electric current is passed through the sheets from one outer face to the other, at a localised area, and the heat generated at the interface (assisted by externally applied pressure) causes fusion of the sheets within that area. The pressure and the localising of current are effected by nipping the sheets between two small circular tipped electrodes, usually made of a copper alloy and passing current between them. Variations are found in the projection, seam, and butt welding processes.

Flash butt welding, which differs from butt welding, makes use of the high electrical resistance between relatively rough contacting faces. If two metal parts with identical cross-sectional shapes are held in contact whilst an electric current is passed from one to the other, heat is generated at the many points of local contact, causing the metal there to burn and explode. Some heat from this burning is transferred back into the bodies of the parts before the exploding metal bursts out from between the faces in showers of sparks. The gap left by the explosion is closed by the machine and the process is repeated until sufficient heat is transferred to the parts to allow them to be welded together under a suddenly applied thrust. See Welding.

**Electrochemical Equivalent.** When a quantity of electricity is passed through an electrolyte it sets free ions (*q.v.*) of the elements present. The weights of the individual ions liberated by any given quantity of electricity are proportional to their chemical equivalents. In order to correlate the available information, the electrochemical equivalent has been defined as the weight in grams of

an ion liberated from an electrolyte by one coulomb of electricity. Faraday's laws show this is proportional to its chemical equivalent. See Coulomb.

**Electrochemical Series.** A list of the metallic elements in the order of magnitude of their single electrode potentials (*q.v.*). The common metals run from gold, the most noble, through platinum, silver, mercury, copper, hydrogen, lead, tin, nickel, iron, zinc, manganese, aluminium, magnesium, and calcium to sodium. A metal such as zinc, later than hydrogen in the series, will liberate it from acids. A metal late in the series will displace an earlier one from a solution of its salts; *e.g.* copper is deposited by aluminium or iron. In general the corrosion resistance of a base metal is lower than that of a noble metal. This is not true of a few metals like aluminium, which form a protective skin of oxide. Two metals in contact and in an electrolyte, sea-water for example, will influence the corrosion of each other according to their relative positions in the series. Engineers and metallurgists must therefore consider these factors in their designs.

**Electrocution.** Death from an electric shock. This is a hybrid word formed in an attempt to combine execution and electricity. It was first used in America and originally referred to the administration of an electric shock to carry out the capital sentence on a condemned criminal; but the term electrocution is now used to describe any death resulting from an electric shock. Electrocution is, for example, a humane method of destroying dogs.

Electrocution of criminals was first adopted by the state of New York, where a law making it obligatory was passed on June 4, 1888. The first criminal so executed was William Kimmber, at Auburn prison, Aug. 6, 1890. Electrocution for capital offences has now been adopted by 26 states of the Union.

The apparatus for carrying out the sentence of electrocution consists of an alternating dynamo, capable of generating current at a maximum pressure of 2,000 volts, connected to a chair fitted with binding straps and adjustable head and leg electrodes. When the criminal has been seated in the chair, his head, chest, arms, and legs are secured with the straps; one electrode, is affixed to the head, and a second to the calf of the leg. The full pressure of

2,000 volts is applied for four secs., reduced to 500 volts for one min., and again raised to full pressure for four secs. A final contact is then made to abolish reflexes in the dead body. The criminal is dead within two mins. of entering the execution chamber. Electrocution is believed to be painless and instantaneous; but scientific opinion is divided on that point, though there is little doubt that circulation and respiration cease with the first electrical contact. See Capital Punishment.

**Electrode.** Term applied to the terminals of a voltmeter, the vessel containing the liquid in electrolysis. Faraday distinguished the one by which the current enters the cell as the anode, and the one by which it leaves as the cathode. In an electro-plating bath, the articles being plated constitute one of the electrodes of the bath. The term is also applied to the two carbons of an electric arc lamp and the terminals of an electric furnace, where one may be a rod of carbon, and the other the metal container of the furnace cell. The filament, plate, and grids of a thermionic valve are also known as electrodes.

**Electro-deposition.** This subject is considered under three heads: Electro-plating or electro-gilding, in which one metal is permanently deposited on another; Electro-typing, in which a metal is deposited on a surface from which it is afterwards removed; and Electro-metallurgy, in which metals are refined by causing a pure element to be deposited on a metallic surface while foreign elements are rejected in an electrolytic bath. The physical action on which all these processes depend is described under Electrolysis.

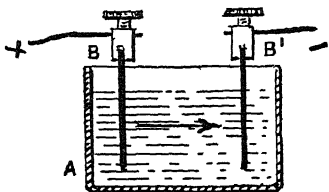
**Electrode Potential.** If two metals are placed in a solution so that they will form a cell, a certain electrical voltage will be produced; this cell voltage is the algebraic difference of two single voltages, corresponding to the two metallic electrodes. Considering the half-cell of one metal in a solution, containing 1 gram-molecule of its ions per litre, the single voltage is known as the electrode potential. The normal electrode potential of hydrogen is taken as zero and the values for metals are expressed in a scale based on hydrogen, ranging from negative for the base metals to positive for the noble metals. See Electrochemical Series.

**Electrodynamics** or **ELECTROKINETICS.** Science which deals, in contrast with electrostatics (*q.v.*),



with the motion of electricity, *i.e.* with current electricity. Ampère's work in 1820 laid the fundamental laws governing the subject. See Electricity.

**Electrolysis.** Decomposition of liquids by electric current. The liquid which undergoes such action is called an electrolyte (*v.i.*). Water may be entirely decomposed into its two elements, oxygen and hydrogen, the gases being liberated at opposite sides or ends of the apparatus—a cell—in which the operation is carried out. With solutions, *e.g.* sulphate of copper in acidulated water, the decomposition may be only partial, while under suitable conditions, though decomposition goes on, the state of saturation of the solution will be maintained.



Electrolysis. Fig. 1. Diagrammatic view of cell for decomposition of liquids by electric current. See text

The elements necessary for the exhibition of this phenomenon are shown in the accompanying diagram (Fig. 1): A is the container, which must either be of a material which is non-conducting electrically or be insulated so that the current of electricity will not pass through it; while B, B' are two conductors immersed in the liquid, each being provided with an arrangement by which it may be connected to a source of electricity. The combination constitutes a cell. The current enters the cell at B, which thus becomes the positive pole or anode of the element, and, after traversing the bath, escapes at B', which is thus the negative pole or cathode, these poles being distinguished by + and — symbols.

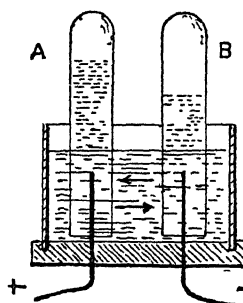
If the conductors be two strips of platinum and the liquid water, then, when the current passes, oxygen is liberated at the surface of the anode and hydrogen at the surface of the cathode. The two gases may be easily collected by an arrangement indicated in Fig. 2, which represents the original voltameter. A and B are inverted glass test tubes, each having introduced into it at the bottom one of the electrodes. The tubes are first filled with the electrolyte—the water, which is usually slightly acidulated to facilitate the action

—and when the current passes, the gases which are released at the surfaces of the electrodes rise to the top of the tubes and displace the liquid. Two notable points are to be observed here: the gases collect separately, and no action whatever is apparent in the body of the bath between the two tubes. But when oxygen in the one tube is set free, hydrogen must be liberated at the same instant; the latter does not, however, collect side by side with the oxygen in the tube where it is separated, but by some invisible action passes out of that tube across the bath and appears in the other tube. Similarly, there must be a migration of the oxygen from the hydrogen collecting tube back to the oxygen tube. Thus one of the elements separated travels with the electric current and the other against it; to the former Faraday gave the name *cation*, meaning that which goes down, and to the latter the term *anion*, or that which goes up. The theory is advanced, and reference should be made to a textbook on physics.

The phenomenon of electrolysis is not only profoundly interesting scientifically; it has received industrial applications of the first importance. Electro-metallurgy depends largely upon it; electroplating wholly. The phenomenon may not, however, be always beneficial. In industrial practice the electric current is generated and caused to flow through the cells by means of a dynamo; but a current may be induced in the cell itself, as in the ordinary voltaic or galvanic batteries, by the employment of two dissimilar metals immersed in a suitable electrolyte. A current may even be set up between two metals of the same kind, provided there be a slight difference in their molecular or chemical structure. Such a current may be sufficient to set up electrolysis if other conditions are favourable. Hence machinery or metal structures immersed in water, or in solutions, may present the conditions necessary to set up electrolytic action and decomposition. For the uses of Electrolysis in medicine, and the conditions treated with it, see Electrotherapeutics; see also Electro-Metallurgy; Voltameter.

**Electrolyte.** Conducting solution which will dissociate into particles, or ions, on the passage of an electric current. The solution may be composed of a salt dissolved in water or fused, either by itself or with other salts or acids. The positively charged particles, cations, will proceed to the negative electrode or cathode, while the anions go to the anode. Thus, if a current be passed through a dilute solution of common salt, NaCl, the sodium cations, Na<sup>+</sup>, will go to the cathode and the chlorine anions, Cl<sup>-</sup>, to the anode. Once they reach their respective electrodes, the ions lose their charges and re-form atoms, which may be liberated as a gas, deposited as a solid, or react with the solution. In the example, chlorine gas is liberated at the anode, but the sodium reacts with water to form caustic soda at the cathode. But if, instead of being dissolved in water, the salt were to be fused, electrolysis of the melt would give pure sodium and chlorine. Pure water will not readily conduct electricity, but the addition of very small amounts of molecular compounds which will ionise, such as acids or salts, renders it an excellent electrolyte, as it splits up into its component atoms of hydrogen and oxygen. See Electrolysis; Ion.

**Electrolytic Polishing.** Process for imparting a bright lustre to metal objects instead of the duller surface resulting from electroplating. It consists of reversing the current flow through the electrolyte, so that the object treated forms the anode instead of the cathode. A minute amount of the



Electrolysis. Fig. 2. A and B are inverted test tubes collecting the oxygen and hydrogen set free from water by electrolytic action

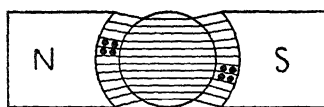
metal surface is removed by the treatment, leaving a bright, smooth finish. Silver plated objects, for example, need no subsequent buffing; objects of complex shape, which it would be impossible to polish by mechanical methods, are turned out with a lustrous surface direct from the bath. The electrolyte is an acid solution which varies with the metal to be "electro-polished."

**Electro-Magnetic Machine.** Term covering virtually every type of electrical machine met with outside a laboratory. At one time, electricity and magnetism were thought to be totally different

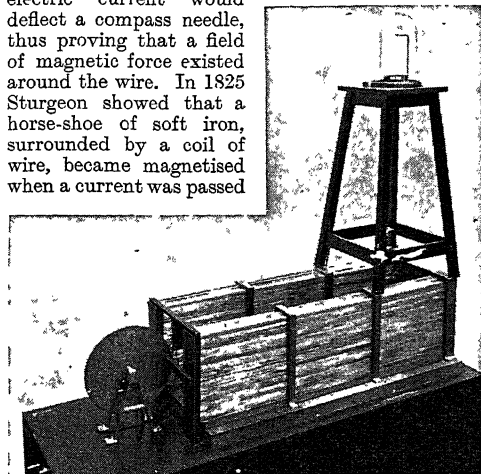
phenomena, but in 1820 the famous Oersted experiment proved them to be inter-related. Oersted (*q.v.*) found that a wire carrying an electric current would deflect a compass needle, thus proving that a field of magnetic force existed around the wire. In 1825 Sturgeon showed that a horse-shoe of soft iron, surrounded by a coil of wire, became magnetised when a current was passed

duced in that part of the disk which lies between the magnet poles at any given instant.

From this it is a simple step to an elementary generator consisting of a single conductor bent into a loop or single-turn coil, rotating between the poles of a magnet as shown in Fig. 2. Each end of the loop is connected to a collector or slip-ring with a brush making rubbing contact to connect the loop to an external circuit. At any given instant each half of the loop is cutting the field in opposite directions (Fig. 3), so that, as the conductor is doubled back on itself,



Electro-Magnetic Machine. Fig. 4. Development of the elementary machine: multi-turn coil revolving in concentrated field produced by pole-pieces and iron core

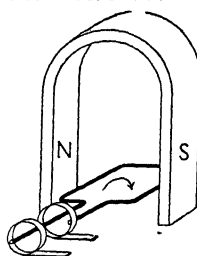


Electro-Magnetic Machine. Fig. 1. Faraday's magnet and disk, 1831. Earliest form of electro-magnetic machine. Crown copyright. From an exhibit in the Science Museum, Kensington

through the coil, thus producing the first electro-magnet.

It was left to Faraday to prove the converse of Oersted's conclusion—that a conductor in a changing magnetic field, *i.e.* a field which was either growing

stronger or dying down, had a current induced in it. He reasoned that a conductor which moved in a stationary magnetic field, cutting the lines of magnetic force, would also have a current induced in it.



Electro-Magnetic Machine. Fig. 2. Elementary machine with single-turn coil or loop revolving between magnet poles. Note collector or slip rings

His apparatus, from which developed the electrical machine, consisted of a copper disk rotating between the poles of a permanent magnet (Fig. 1). Rubbing contacts on the rim of the disk and the axle collect the current in-

duced in that part of the disk which lies between the magnet poles at any given instant. From this it is a simple step to an elementary generator consisting of a single conductor bent into a loop or single-turn coil, rotating between the poles of a magnet as shown in Fig. 2. Each end of the loop is connected to a collector or slip-ring with a brush making rubbing contact to connect the loop to an external circuit. At any given instant each half of the loop is cutting the field in opposite directions (Fig. 3), so that, as the conductor is doubled back on itself,

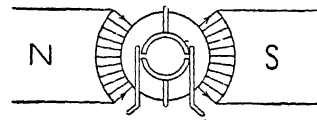


Electro-Magnetic Machine. Fig. 3. Diagram showing the two sides of a revolving loop cutting a magnetic field in opposite directions

put of the machine to the point where it has practical value.

As one coil-side only reaches a position midway between the poles, it ceases to cut the field and the electro-motive force drops to zero—to rise again in the opposite direction. The current flowing in the external circuit from the brushes is an alternating one, its frequency of reversal being proportional to the speed of ro-

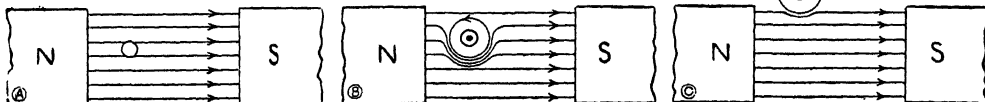
tation. If direct current is required, some device must be added to reverse the connexions between the coil and the external circuit at each revolution. A commutator in its simplest form is made by replacing the slip-rings by a single collector-ring or tube which is split lengthwise into two sections insulated from each other and from the shaft. One end of the loop or coil is connected to each half so that, as the coil revolves, the connexions to the brushes are automatically reversed in step with the alternations of the



Electro-Magnetic Machine. Fig. 5. Elements of commutation: connexions to brushes are being reversed before coil re-enters magnetic field

electro-motive force. This produces a unidirectional current in the external circuit (Fig. 5). Such a machine may be regarded as the forerunner of the direct-current generator or dynamo (*q.v.*).

**REVERSIBLE ACTION.** Besides converting mechanical power into electrical energy, it is possible to reverse the action, so that electrical power supplied to a coil in a magnetic field is made to produce rotation, and hence mechanical energy. The action can be understood by reference to Fig. 6, where A represents a conductor carrying no current, lying in a magnetic field. When a current is passed through it, as at B, it becomes surrounded by its own magnetic field (represented by the circle). This, interacting with the field due to the magnet (N.S.), tends to bend its lines of force, which may be regarded as elastic and, in trying to straighten themselves, push



Electro-Magnetic Machine. Fig. 6. Motor principles: A. Conductor carrying no current; B. Field produced around conductor distorting main field; C. Main field straightens out, forcing conductor to move out of field

the conductor out of the field. A machine with a commutator can produce continuous rotation, and thus function as an electric motor, the speed being governed by the strength of the magnetic field, by the current passing through the coil, and by the mechanical load applied. A machine without a commutator will also run as a motor when supplied with *alternating* current; but only at one speed, corresponding to the frequency of alternation of the supply—i.e. it is a *synchronous* machine.

**CLASSIFICATION OF MACHINES.** *Generators* convert mechanical into electrical energy; they fall into two main classes, the direct-current (D.C.) generator or dynamo, and the alternating-current (A.C.) generator or alternator (*q.v.*). *Motors* convert electrical into mechanical energy; they may also be divided into two main classes, D.C. and A.C.; while A.C. motors can be further subdivided into synchronous and asynchronous machines, the latter capable of delivering power at other speeds than that fixed by the frequency. (See *Motor*, *Electric*.) *Converters* are machines which change electrical energy of one type or pressure to electrical energy of another type or pressure. They fall into three groups: A.C.-D.C. (or vice-versa); A.C.-A.C.; and D.C.-D.C.

#### Current Conversion

Alternating to direct conversion is the principle in (a) *Motor-generators*, in which a straightforward A.C. motor is mechanically connected to a straightforward D.C. generator; (b) *Rotary converters*, consisting of a single machine built like a D.C. generator, but with the addition of slip-rings whereby A.C. is fed into the rotating conductors, to reappear as D.C. at the commutator. The machine can be regarded as a synchronous A.C. motor and a D.C. generator condensed into one machine, with all parts in common. (c) *Motor converters*, which consist of two machines, outwardly resembling a plain motor-generator, but more complicated in that the rotating conductors of the two machines are electrically as well as mechanically connected. The A.C. end functions half as a motor and half as a transformer, while the D.C. end functions half as a plain D.C. generator and half as a rotary converter.

A.C.-A.C. converters can be divided into *transformers* for changing from one voltage to

another, and *frequency changers*. The transformer, although a true electro-magnetic machine, has no moving parts, but works on the principle of Faraday's earliest induction experiments. Two coils are magnetically linked by an iron core. The primary coil is excited by an alternating voltage, and the changing magnetic field which it produces induces an alternating voltage of the same frequency in the secondary coil. This secondary voltage is proportional to the ratio of the number of turns in each coil, so stepping up or down is simple. Frequency changers are what their name implies, and may be regarded as motor-generators with two A.C. machines.

#### Stepping Direct Current

Direct current cannot be changed from one voltage to another without rotating machinery. Motor-generators can be used, with both machines arranged for D.C., and there are two special machines, the *rotary transformer* or *dynamotor* (*q.v.*) and the *metadyne* (*q.v.*) or *amplidyne*. The former may be regarded as a motor and a dynamo with two sets of rotating conductors and two commutators, revolving in a common magnetic field. It can convert D.C. from one voltage to another in a fixed ratio only, which is decided when the machine is built. The second class of D.C.-D.C. converter, developed in 1932, consists of a direct-current motor with a second set of brushes operating on a different part of the commutator. By varying the method of connexion, and by the addition of extra windings on the field-magnet system, it can be made to perform extraordinary duties, *e.g.* operating as a constant-current D.C. transformer of infinitely variable ratio; or acting as a power amplifier.

#### Electro-Magnetic Wave.

Wave consisting of an electric force and a magnetic force, set up in a dielectric in directions perpendicular to each other and both perpendicular to the direction of propagation. The existence of these waves was predicted by Clerk-Maxwell in 1855-64 and verified in 1887-88 by Hertz; and both initial theory and experimental confirmation were such brilliant investigations that their results were epoch-making.

The waves originally recognized by Clerk-Maxwell as electro-magnetic were those due to the sudden release of a charge on an insulated conductor, such as the sparking across of a sphere-gap.

Starting from the assumption that this sudden release of energy was of the same nature as a mechanical blow upon an elastic material, he argued that a similar series of vibrations would occur, and proceeded to calculate their velocity of propagation and other properties by means of the same relationships.

Now the velocity of propagation of a shock or sound in air, or an impulse through an elastic solid, is given by  $v = \sqrt{e/\rho}$ , where  $e$  is the elasticity (*i.e.* stress/strain), and  $\rho$  is the density of the material. The electrical equivalent for elasticity is

$$Q/er^2 \times 4\pi r^2/Q = 4\pi/e,$$

where  $e$  is the dielectric constant; for density,  $4\pi\mu$ , where  $\mu$  is the permeability of the medium. Substituting, this gives  $v = \sqrt{(1/\epsilon\mu)}$ , which works out at  $3 \times 10^{10}$  cm. per sec., or 186,000 miles per sec. Thus the velocity is identical with that of light, and the waves travel in the same medium. The conclusion is, therefore, that light waves are also electro-magnetic. Maxwell deduced further that every transparent substance must be an insulator, and that the dielectric constant (specific inductive capacity) of any dielectric would equal the square of its refractive index.

#### Hertz's Simple Apparatus

The apparatus devised by Hertz for generating and detecting the waves was quite simple; but his demonstration of their compliance with Maxwell's equations and predictions was so graphic as to be almost sensational. He used the discharge of a sphere-gap, charged by an induction coil, as his source. Such a discharge creates a low resistance path for itself by its initial spark, through which the opposite charges in the two spheres rush together, and then overshoot, reversing the polarity of the spheres and continuing the process until damped out by circuit losses; much as the levels of the liquid in the two arms of a U-tube will oscillate after their relative heights have been disturbed. The spheres were fixed to metal rods in line with each other, bearing metal plates at their outer ends, into which the oscillating charges surged. Waves due to the movement of the charges were radiated through space, and could be detected by means of a similar sphere-gap joined by a circular loop of wire. When the length of the wire is such that the period of oscillation is the same as in the generating circuit, small sparks pass across the

gap. Thus the principles of resonance and tuning of an oscillating circuit were illustrated.

Having devised means for creating and detecting the waves, Hertz proceeded to show their similarity to light waves by reflecting them from a metal plate, refracting them with a prism made of pitch, and polarising them with a metallic grid. Finally, he formed a standing wave by causing the original wave to interfere with its own reflection, and by measuring the distance between successive nodes located by his detector, he found the wave-length, and verified the velocity of propagation. He confirmed that the waves were identical with light in all but wave-length or frequency.

#### Electro-Magnetic Energy

Although the waves were generated by electrostatic means, it is not difficult to show that they contain electro-magnetic energy as well. Before the charged spheres begin to discharge, their energy is entirely electrostatic and equal to  $\frac{1}{2} CV^2$ , where  $C$  is the capacity and  $V$  the voltage. The spheres are, in fact, a charged condenser, with the insulating medium between them—here the air forming a dielectric in a state of strain. Immediately the discharge begins, however, a current flows between them, relieving the strain in the dielectric, but creating a magnetic field in the space round the conducting rods. At the instant when the voltage between the spheres is zero and is about to reverse, the dielectric strain has disappeared and the electrostatic energy has vanished; but the current is a maximum and therefore the electro-magnetic energy, equal to  $\frac{1}{2} LI^2$ , where  $L$  is the inductance and  $I$  the current, is also a maximum. The energy keeps changing from electrostatic to electro-magnetic and back again, until the oscillation is damped out through resistance, dielectric, and eddy-current losses. The wave-lengths were of the order of 100–1000 m/s.

Employing the values for the energy given above and assuming negligible resistance, the period of oscillation  $\tau$  is given by

$$\tau = 2\pi \sqrt{LC} \text{ sec.,}$$

and the frequency  $f$  in cycles per sec. by

$$f = 1/\tau = 1/2\pi \sqrt{LC}.$$

The wave-length  $\lambda$  is given by  $\lambda = 300/f$  metres

$$= 1885 \sqrt{LC} \text{ metres,}$$

where  $f$  is in megacycles per sec.,  $L$  in microhenries, and  $C$  in microfarads.

Visible light is produced at wave-lengths ranging from 0.4 microns (violet) to 0.7 microns (red). Atomic physics has revealed the mechanism whereby light rays (including infra-red and ultra-violet) are formed. Each element is characterised by a fixed number of electrons circling round the nucleus. These keep to definite orbits, each having a definite radial distance from the common centre.

But if a substance is heated, some of the electrons in its atoms are able to move at high frequency from their own orbits to the next farther from the centre and back again; and as electrons are negative charges of electricity, they give out electro-magnetic waves when they oscillate.

An electro-magnetic spectrum is given in the figure, showing the relative position of visible and invisible light, and below them radio waves belonging to the various bands, audio-frequency waves, with those of supersonic frequency between the last two; while above the light waves are X-rays, gamma rays, and cosmic rays.

with those of supersonic frequency between the last two; while above the light waves are X-rays, gamma rays, and cosmic rays.

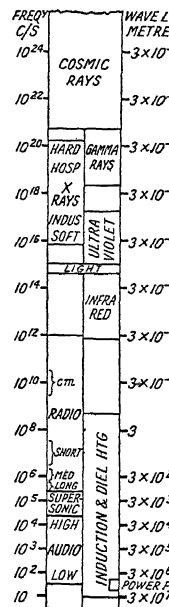
**Electro-Magnetism.** Term used for the branch of science which deals with the connexion between electrical and magnetic phenomena. In 1820 Hans Christian Oersted (*q.v.*) discovered that a wire conveying an electric current is surrounded by a magnetic field, and that a freely moving magnetic needle sets itself along a tangent to a circle surrounding the wire. Oersted's discovery was followed by the researches of D. F. J. Arago and A. M. Ampère and others, but it was Faraday who showed how to obtain electricity from magnetism, and thus laid the foundations of the electrical industry. See Electro-Magnetic Machine.

**Electro-Metallurgy.** Term used to describe those processes in metallurgy in which electricity supplies the energy. The scope is vast, covering all fields of metallurgy: the extraction of metals from their ores, refining, fabrication, joining, etc. Few metal articles are produced without being subjected to at least one electro-metallurgical process at some stage. The action of the electric current may be purely electrolytic (*see* Electrolysis), or electricity be used merely to generate heat. In the electrolysis of fused salts, both effects are used. Some other subjects included in the broad classification are described under individual headings (*see* Electric Welding; Electro-plating). Electro-metallurgy was born soon after Volta's discovery of the galvanic cell. Davy demonstrated the electric arc in 1807; Faraday carried on the work; Elkington developed electrolytic processes in England; and, once the dynamo was introduced, the industry grew rapidly.

Apart from electro-plating, the electrolysis of salts in water solution is used in two ways in metallurgy: for the extraction of metals from their ores, and for the refining of metals. Fundamentally the processes are similar. In both the metal is deposited electrolytically from a solution of its salts on one electrode of a cell; but in refining the other electrode is composed of the impure metal and dissolves continually, keeping the metallic content of the bath virtually constant. The impurities either remain in the solution or form a sludge which can be removed periodically. Copper was the first metal to be refined electrolytically by Elkington and is still the most widely treated.

#### The Refining of Metals

Impure "blister" copper contains not only undesirable impurities, such as nickel, arsenic, selenium, tellurium, and antimony, but also varying amounts of gold, silver, and platinum. These are recovered by electrolytic refining and their value often repays the cost of the whole process. The crude copper, cast into anodes weighing 500–800 lb. each, is placed in a solution of copper sulphate, containing 15–20 p.c. of free acid and held in lead-lined tanks. In the multiple system these copper anodes alternate with thin sheets of pure copper, which form the cathodes. When the current is passed, the impure



Electro-Magnetic Wave. Table of an electro-magnetic spectrum, showing visible and invisible light, X-rays, radio, etc.

anodes gradually dissolve over a period of about 30 days and pure copper is deposited on the cathodes. The metallic impurities chiefly remain in the solution; the precious metals form an insoluble slime which is collected.

Silver can be refined in a solution of silver and copper nitrates. In the Thum cell, the bottom is itself the cathode and the impure silver anode is held in a canvas bag above it. The silver is deposited in crystals, as it is in the Moebius cell, where anodes and cathodes are arranged much as in copper refining. Stainless steel cathodes are used and the pure silver crystals are scraped off by wooden paddles. Gold is refined by the Wohlwill process, using a hot acid solution of gold chloride. High current densities are used and the electrolyte stirred. The cathodes are gold strip.

Nickel is frequently refined electrolytically in nickel sulphate solutions containing boric acid. The anodes and cathodes are separated by canvas, and usually aluminium sheets are used as starting blanks for the cathodes. Lead can be refined by the Betts process, which uses a system of multiple connexion: the bath is a solution containing lead fluosilicate and hydrofluosilicic acid. Bismuth, tin, iron, and antimony are other metals that can be refined electrolytically.

#### Extraction of Low Grade Metals

Electrolytic extraction of metals is mainly confined to those low grade ores which have a considerable proportion of their metallic content present in a readily soluble form. Copper is the metal most widely extracted in this way; zinc is increasingly so, the ore being first roasted and then leached with sulphuric acid. Cadmium and manganese are further examples. Metals extracted by electrolysis of their fused salts are aluminium, magnesium, beryllium, sodium, lithium, calcium, and cerium. In general the processes depend upon two factors: fused salts behave electrolytically much as their aqueous solutions do, but they are better conductors of electricity; further, electrical resistance heating will usually keep them molten. The electrolysis of fused sodium chloride, for example, results in the liberation of sodium at the cathode and chlorine at the anode. Sometimes the fused salts merely act as carriers for the material electrolysed, *e.g.* alumina. Magnesium chloride, however, is it-

self fused and electrolysed to produce pure magnesium. Usually the electrical power supplies the energy not only for electrolysis but also for heating the cells and so fusing the salts.

#### Electricity as a Source of Heat

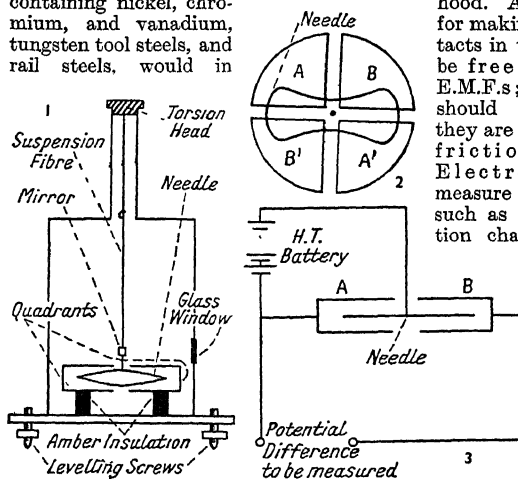
In a third important branch of electro-metallurgy, electricity is used solely as a source of heat. No combustion method can compare with electricity in the speed at which great heat can be directed exactly where it is wanted. Electric furnaces (*q.v.*) fall into three groups: resistance furnaces, used largely in the laboratory and in small scale operations; arc furnaces, for smelting iron and steel and the production of ferro-alloys for steel manufacture; induction furnaces, restricted chiefly to the non-ferrous field. Electric steel was first introduced to supply a cheaper substitute for the high grade but expensive crucible steel. Its success soon led to applications in the alloy steel sphere. Stainless steels, containing nickel, chromium, and vanadium, tungsten tool steels, and rail steels, would in

can withstand. Arc furnaces have also been used for the distillation of zinc. Indirect arc furnaces, in which the heat, generated by an arc between two electrodes above the metal, is radiated on to the melt are used in some non-ferrous foundries.

**Electrometer.** An instrument for determining potential differences by the measurement of the displacements of charged conductors under the action of electrostatic forces. The insulation of the electrodes of such instruments is usually extremely good; they do not require a continuous electric current for their operation, although a constant auxiliary source of potential difference is needed. Except when a steady source of potential difference is being measured, the electrometer should be surrounded by an earthed shield to prevent the induction of electrical charges on the system brought about by the movement of charged bodies in its neighbourhood. Any switches used for making electrical contacts in the system must be free from contact E.M.F.s; sliding surfaces should be avoided, as they are liable to produce frictional charges. Electrometers also measure small currents such as occur in ionisation chambers. In this

application, the instrument should have as small an electrical capacity as possible.

Until recently the quadrant electrometer has been most used. It consists of a thin metal needle



Electrometer. The quadrant type: Fig. 1. The metal needle with fibre suspension. Fig. 2. Plan of needle and quadrant system. Fig. 3. Electrical connexions for measuring an unknown potential difference

all probability never have been marketed without the assistance of the electric arc furnace. The alloying elements, such as manganese, chromium, titanium, and molybdenum, added to steels to give properties necessary for modern engineering design, are usually added in the form of ferro-alloys, chiefly made in furnaces similar in design to those used in electric steel manufacture. Temperature is limited not by the degree to which the arc can be raised, but by the degree which the refractory lining of the furnace

(Fig. 1) suspended by a phosphor-bronze or silvered quartz fibre so that it hangs within a shallow circular box formed by four fixed metal double quadrants each separated by a narrow air gap. Opposite quadrants, A and A', B and B', are electrically connected (Fig. 2). A schematic diagram of electrical connexions for measuring an unknown potential difference is shown in Fig. 3. If the high tension battery is omitted and the needle is therefore directly connected to quadrants A and A', then the deflection will be in the

same sense whatever the direction of the applied potential difference, and the electrometer will measure alternating voltages. Electrostatic volt meters are often designed after the principle of the quadrant electrometer; they are more robust but less sensitive.

Other devices are: (1) The string electrometer, simple in construction and with the advantage, for small current measurement, of having a very small capacitance of about 5 micro-microfarads. It consists of a fine silvered quartz or Wollaston wire (S in Fig. 4) which is maintained taut at right angles to the electric field maintained between two parallel electrodes A and B. Any change in the potential of the string will result in its displacement, which can be observed with a microscope or recorded photographically. (2) The Hoffman electrometer, an adaptation of the quadrant instrument in which a large increase in sensitivity is secured by making the needle asymmetrical and substituting binants for quadrants. (3) The Lindemann electrometer, a compact instrument which can be actually mounted on a telescope with which it is used, in combination with a photo-electric cell, for measurement of stellar intensity. It is similar in principle to a quadrant electrometer, but four cross-connected plates replace the quadrants and a thin needle is suspended at the centre on a torsion wire.

The photographic illustrations Fig. 5, show a simple type of quadrant electrometer, and also a vertical capillary electrometer. This latter depends for its action upon an increase in the surface tension where a column of mercury is in contact with dilute sulphuric acid, when an E.M.F. is applied.

**Electro-Motive Force.** The electrical pressure developed by a cell which enables it to produce an electric current in an external circuit. The practical unit of E.M.F. is the volt (*q.v.*).

**Electron.** One of the fundamental particles that constitute matter. It received its name in 1891 from Johnstone Stoney who thought of it as the atom of electricity, *i.e.* the smallest quantity of electricity that can exist. An atom is thought to consist of a small positively charged

centre or nucleus round which electrons circulate in orbits. The electron carries the smallest possible negative charge, while a proton (*q.v.*) carries the same charge with opposite sign. Thus if the nucleus contains  $n$  protons and  $m$  neutrons (*q.v.*),  $n$  electrons circulate round it; the atom is electrically neutral.

An electric current consists either of the transfer of electrons from atom to atom or movement of positive ions (atoms which have lost one electron). Cathode rays, obtained by an electrical discharge through a vacuum tube, consist of fast moving electrons: Sir J. J. Thomson proved these cathode rays to be particles, but his son, Sir G. P. Thomson showed them to have the properties of a wave motion such as light, *e.g.* to be able to form a diffraction pattern. This has led to the wave mechanical theory of matter which conceives of electrons and other particles as possessing in some

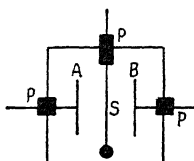
which has the same charge but is 1,840 times as heavy. Electrons and positrons attract one another, and their combination causes mutual annihilation (*i.e.* they both vanish) and the production of a photon or  $\gamma$ -ray. *See* Electricity; Nuclear Fission; Nucleus; Radio-activity; Wave Mechanics.

**Electron Bomb.** Term for incendiary bomb of magnesium and thermite. It should be extinguished only by a spray of water; water in bulk spreads the burning metals. For fuller description *see* Incendiary Weapons.

**Electron Compound.** Term used in metallurgy to denote an intermetallic compound which does not conform to the normal laws of chemical valency, but has a similar ratio of valency electrons to atoms. Hume-Rothery in 1926 pointed out that alloys having the body-centred cubic structure have a valency electron/atom ratio of 3 to 2; thus CuZn has 3 valency electrons and 2 atoms, while  $\text{Cu}_3\text{Al}$  has 6 valency electrons and 4 atoms. Similarly the face-centred cubic structure has a ratio of 21 to 13 and the close-packed hexagonal a ratio of 7 to 4. *Consult* Atomic Theory for Students of Metallurgy W. Hume-Rothery, 1946.

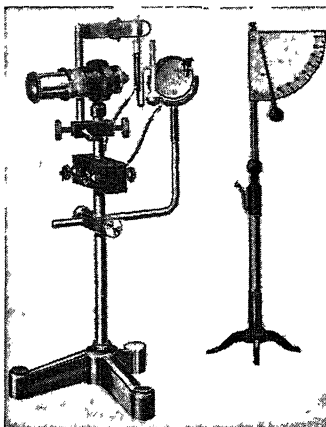
**Electro-Negative.** In electricity, negative is a term used for the return path or point of lower potential in a circuit. Early theories recognized positive and negative electricity as two separate and distinct entities (the two-fluid theory). The later one-fluid theory assumed that the negative pole of a battery or circuit was deficient in something of which the positive pole had an excess; this would cause a current to flow from positive to negative when they were connected through a conducting circuit.

A later theory, that a current flow is caused by the handing on of electrons (*q.v.*) from one atom to another, recognized that the electron is itself negative and that the negative pole has an excess of electrons—the positive pole being deficient. This may seem confusing; but a flow of negative electrons from negative to positive may still be regarded as a current flow from positive to negative so that, for all practical purposes, conceptions of electric circuits can remain unchanged. A chain of buckets of water passed from a well to a fire and returned empty may equally be regarded as a chain of air-filled buckets passing from the fire to the well. *See* Electro-Positive.



P = Insulating Plugs

Electrometer. Fig. 4. The string type used for small current measurements



Electrometer. Fig. 5. Vertical capillary electrometer, left; simple quadrant type, right

way at the same time both particle and wave properties. This means that the picture of the atom given above is only a very crude approximation.

The mass of the proton (or hydrogen nucleus) is 1,840 times that of the electron and is virtually the same as that of the neutron. Thus the mass of an atom resides in the nucleus. A particle with the same mass as, but of opposite (positive) charge to, the electron has been discovered in cosmic rays. It is called the positron, and should not be confused with the proton



## ELECTRONICS: A NEW DEVELOPMENT

W. Wilson, D.Sc., Manager G.E.C. Development Lab.

*This article explains the principles governing electron flow and transmission, and outlines the main applications of the science of electronics. Cross-references are given throughout the article to relevant entries elsewhere in this Encyclopedia*

Electronics is that branch of electrical engineering which depends on the passage of an electric discharge through a rarefied gas. Its operation had been recognized since the beginning of electric power engineering; its application began to accelerate about 1934.

The nature and scope of electronics can be indicated by a brief historical survey. A century ago electric power was devoted to one main purpose, the production of light. This was supplied by means of three types of lamp, the arc,

modified as in (3) to serve purely as a rectifier. The large continuously evacuated steel tank form (4) followed, and the gap between (3) and (4) was bridged by the pumpless steel tank rectifier (5). The last three all possess a mercury pool at their base as a cathode, and 3, 6, or 12 anodes.

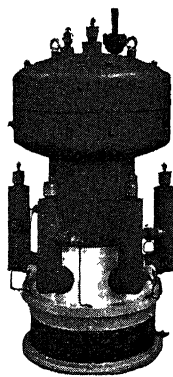
**Discharge Tube** (Fig. 1, B). Not long after electricity was first generated by frictional machines, it was found capable of producing a luminous discharge in an evacuated enclosure, usually known as a

beam of cathode rays was recognized as a stream of electrons. The industrial form illustrated in (5) was not very different except in details (such as the hot filament cathode and the flattened end); and the large metal-tube continuously evacuated model (6) contained much the same parts with additional refinements, such as the revolving film drum. The electron microscope (7) was a cathode-ray tube with three carefully designed electron lenses.

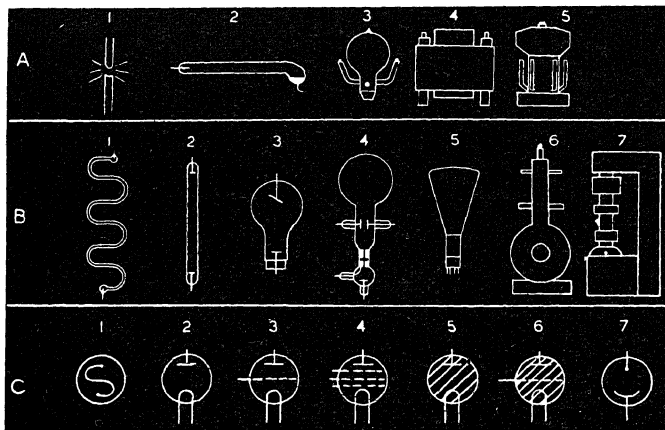
**Filament Lamp** (Fig. 1, C). The incandescent lamp (1) in its first form had a carbon filament. It was soon discovered that carbon particles were discharged from the filament to the inside of the bulb away from the negative end, and that the positive limb cast a shadow, i.e. a thin streak free from deposit. Fleming recognized this in 1904 as due to an electron stream coming from the more negative part of the filament, and embodied the principle in his hot cathode valve (2), which functioned as a rectifier. A third electrode, or grid, was added to form the triode (3); more grids produced, for example, the pentode (4). By inserting a trace of gas or mercury into the vacuum, the gas-filled rectifier diode (5), and G.F. triode or thyatron (6) were evolved, with higher efficiency and current capacity than the vacuum types. A diode with a light-sensitive cathode varied its resistance to current flow in proportion to the light intensity, and constituted the photo-electric cell (7).

A scrutiny of these develop-

ments reveals that definite electronic action appeared at the outset in all of them. Further, in the first and third series, the mercury rectifier A3 is virtually the same device as the small gas-filled rectifier diode C5, magnified by, say, 10,000 to 50,000. Mercury arc rectifiers of all kinds were actually long-established and highly efficient valves, so that the achievements of the radio valve could be repeated on a power scale



**Electronics.** Fig. 2. Pumpless steel tank mercury arc rectifier, grid controlled. Rating 600 amps. See next page

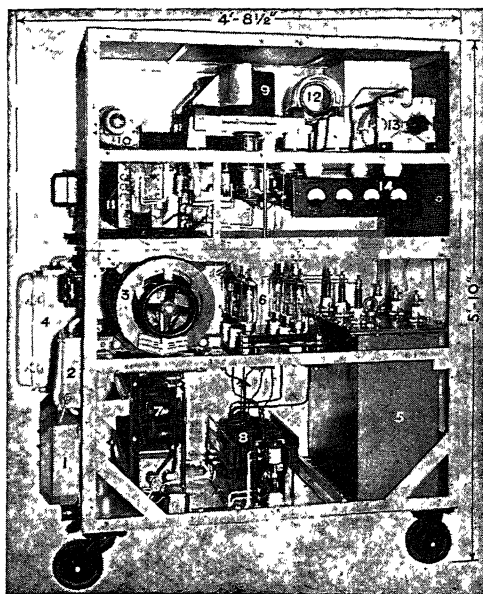


**Electronics.** Fig. 1. Row A. The electric arc: 1. Open arc; 2. Mercury vapour arc; 3. Modified design of No. 2 to serve as a rectifier; 4. Large continuously evacuated steel tank rectifier; 5. Pumpless steel tank rectifier. Row B. Discharge tube: 1. Geissler tube; 2. Moore tube, a predecessor of the fluorescent lamp; 3. Crookes' tube; 4. Thomson's cathode ray oscillograph; 5. Industrial form of C.R. tube with flattened end; 6. Large metal tube continuously evacuated model; 7. Electron microscope. Row C. Filament lamp: 1. Incandescent lamp; 2. Hot cathode diode valve; 3. Triode valve; 4. Pentode; 5. Gas-filled rectifier diode; 6. G.F. triode or thyatron; 7. Photo-electric cell

discharge tube, and incandescent filament. Each gave rise to a separate line of development, shown graphically in Fig. 1.

**Electric Arc** (Fig. 1, A). When two conductors energised at a voltage exceeding about 40 are touched together and then separated by a short distance, the luminous discharge known as the electric arc (1), consisting of a flow of electrons, passes across the gap. Burning of the electrodes is much reduced by enclosing the arc, and prevented altogether by evacuating the enclosure; hence the mercury vapour arc (2), found to possess rectifying properties, since the electron flow could pass only from the mercury cathode to the anode, and the design was then

Geissler tube (1). The amount of light emitted was small, but both intensity and colour were modified later by varying the residual gas and by coating the inside surface with a fluorescent material. Sufficient light was given by the Moore tube (2), which contained a small amount of nitrogen, to give it a short life as a practical illuminant round about 1908. The principle was to be successfully revived later as the fluorescent lamp. Crookes investigated the nature of the discharge, and designed the tube bearing his name (3) by which strong cathode rays, and incidentally X-rays, were generated. A further development by J. J. Thomson gave the cathode ray oscillograph (4), in which the



Electronics. Fig. 3. 4 kW. high frequency generating set. 1. Smoothing filter; 2. 30-amp. isolating switch; 3. Variable auto-transformer for main transformer primary; 4. Main contactor; 5. Main transformer, ratio 400-7875 volts; 6. Mercury vapour rectifier valves, connected 3 phase, full wave output 10,000 V. D.C.; 7. Constant voltage transformer; 8. Filament transformer for rectifier valves; 9. Two oscillator valves; 10. Cooling fan for oscillators; 11. Filament transformer for oscillators; 12. H.F. output transformer; 13. Variable output condenser; 14. Valve filament instruments

by suitably increasing the size of the various components, and adding features from one line of development to apparatus in another.

Description follows of important pieces of electronic equipment and processes. (The references, unless otherwise stated, are to the diagrams in Fig. 1.)

**Thermionic Valve** (Fig. 1, C). It is of interest to examine the differences, apart from mere size, between the small rectifier tube C5 and the power rectifiers A3, A4, or A5. The chief difference lies in the means for starting the discharge. In C5, the filament cathode is heated by the current passed through it, causing electrons to come out of it into the space nearby. Then the application of the voltage between anode and cathode (called the anode voltage) causes the electrons to move towards the anode when the negative terminal is connected to the cathode, the electron flow forming an electric current. When the polarity is reversed, the electrons are attracted into the cathode, and no current passes.

**Mercury Arc Rectifier.** In the power rectifier, the arc is actually struck by means of an auxiliary igniter anode, which is raised

bodily so that contact is broken with the pool cathode. A further difference is in the cathodes themselves, the mercury pool being indestructible, as compared with the filament's life of perhaps 10,000-15,000 hours. The 600-ampere 6-phase pumpless rectifier in Fig. 2 is typical.

**Grid Control.** The effect of a control grid in an electronic device should be understood for both D.C. and A.C. circuits, and for vacuum and gas-filled tubes. In a high vacuum tube such as the triode, C3, which is primarily intended for use on D.C., the grid voltage continuously controls the flow of electrons from the cathode, and hence the anode current; the latter starting, fluctuating, and

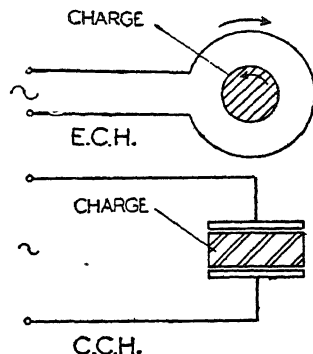
ceasing according to the same series of changes as the former. But in the gas-filled triode, C6, the grid can simply initiate the current, which immediately rises to its full value. The grid is thereafter powerless to vary or stop it.

**Electronic Motor Control.** When used on an A.C. circuit, the grid can cause the current to start at any desired point in each cycle, and hence not only rectify, but also regulate, the R.M.S. value of the current. By employing a D.C. motor in a valve-controlled A.C. circuit, starting, stopping, reversing, and speed control are effected sensitively and conveniently.

**Grid Rectifier** The advantages of a control grid have been added to the power rectifier in Fig. 2, the grids being connected and sup-

ported by the small bushes seen near the anodes.

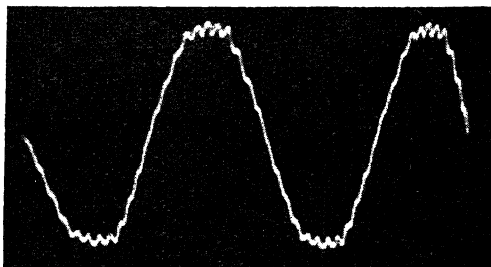
**Inverter.** An A.C. of any desired frequency can be obtained from a D.C. by means of a gas-triode, or,



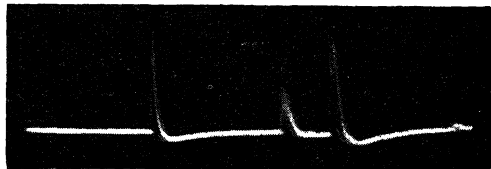
Electronics. Fig. 4. High frequency heating. Above by eddy current; below by capacity current. Note: In E.C.H. the charge forms the short-circuited secondary of a transformer, and in C.C.H. the dielectric of a condenser. Heating is due to the losses in each case

on a large scale, from a grid rectifier. A pilot voltage of the desired frequency is applied to the grid, and causes a power A.C. to appear at the anode.

**High Frequency Heating.** Like the rectifier stage of a radio set, the oscillator stage can also be designed on a large scale, as exemplified by the 4kW set shown in Fig. 3. A typical use for such sets, rated at 4, 10, 25, 75, and even 2,000 kW, is the heating of conductors by inducing eddy-currents in them, and insulators by means of capacity currents, as indicated in Fig. 4. The heat is developed exactly where it is wanted, and

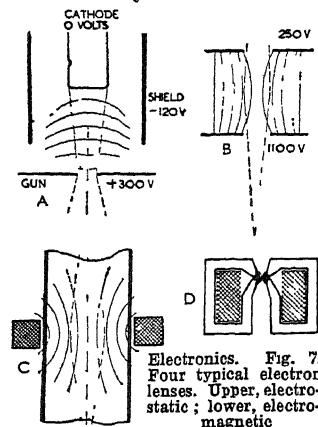


Electronics. Fig. 5. Alternator wave showing 1,200 cycles per second ripple



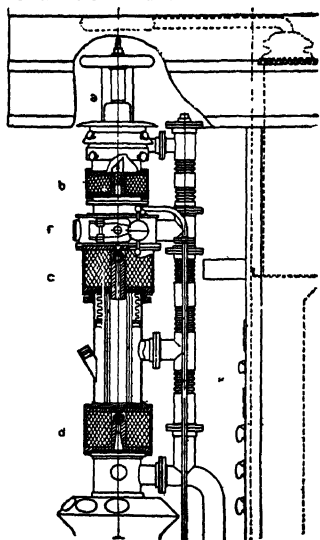
Electronics. Fig. 6. Radiolocation record. See next page

exact temperatures can be obtained by suitable timing of currents; while a great saving in time is usually effected.



Electronics. Fig. 7. Four typical electron lenses. Upper, electrostatic; lower, electro-magnetic

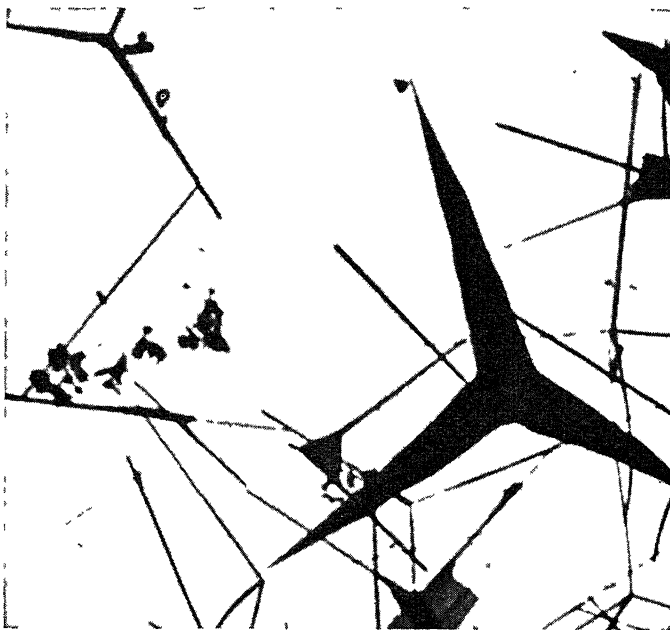
**Photo-electric cells.** Of three types of photo-electric cell, that shown as C7 is the most generally useful, largely because it combines well with the standard amplifier. Its principal function is to act as a substitute for the human eye. It can count the number of products coming from a machine, open a door when a person is about to enter, control the closing of swing bridges, or sound an alarm when smoke is present. It transforms the fluctuations of light on the sound track of a talking film into similar fluctuations of sound.



Electronics. Fig. 8. Cross section of R.C.A. electron microscope showing electron discharge tube at a; the lenses at b, c and d; air lock for inserting specimens at f; control and meter panel at k, and viewing ports for fluorescent screen at base

**Cathode-Ray Oscillograph.** If the discharge of electrons from the anode, which is permitted to spread out over the whole space within the enclosure of a valve, be limited to a thin beam by being passed through a small aperture, it will produce a luminous spot on the fluorescent screen at the end of the tube. Now the beam consists of negative particles and can be deflected by a charged plate (or plates) placed as shown in B4; while the stream of negative particles forms a current, which can be deflected by a magnet or sole-

these and any reflections upon the graph. A radio transmitter is used to generate a succession of pulses, and a receiver connected to the oscillograph to record them; the former being synchronised with the cross-traverse (time-sweep) of the oscillograph spot. The resultant trace on the screen is similar to that in Fig. 6, where the left-hand peak is the image of the initial pulse, and the other two register the arrival of reflections from two separate objects, e.g. aeroplanes, ships, or icebergs. As the signal travels both ways with



Electronics. Fig. 9. Smoke from burning zinc, forming four-spiked dendritic crystals. Magnified by 30,000. See next page

noid. If a fluctuating voltage or current be connected to the deflecting plates or solenoids, the spot will move instantaneously through a distance proportional to the quantity to be measured. A transverse feed can be afforded to the record by a rotating drum as in B6, or by means of a second pair of deflectors at right angles to the first. In this way an extremely sensitive measuring and recording instrument has been formed. An example of its work is seen in Fig. 5, where a voltage wave from an alternator has been recorded, including a fine ripple with a frequency of 1,200 cycles per second.

**Radiolocation.** The presence of a solid or conducting mass can be detected and its distance accurately measured by sending out radio waves and recording both

the speed of light, and the distance to the object concerned, the latter can be read off quickly.

**Flaw Detection.** By using a quartz crystal to convert the radio-frequency signal to a high-frequency sound (supersonic) vibration, and also to convert back the echo to an electric wave, radiolocation can be applied to the location of flaws in solids. The record in Fig. 6 (p. 3011) was taken by the Hughes flaw detector upon a steel forging, the two echoes coming from the far side of the forging and from a cavity within it respectively. The same method is used for sounding at sea, and for measuring height above the earth surface in aircraft.

**Electron Lens and Microscope.** Both methods of deflection make it possible to focus an electron

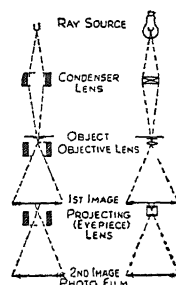
beam, just as light rays are focused, by glass lenses. Electric and magnetic fluxes alike can refract the rays, four typical electron lenses being shown in Fig. 7. Those in A and B are electrostatic, used in glass cathode ray tubes, the fluxes being produced by maintaining the electrodes at different voltages as shown. Lens A functions like the condenser lens of a projecting lantern, since it collects rays coming from the cathode and concentrates them through the aperture; while B focuses the rays to a spot. The remaining two are electromagnetic lenses, C being of long focus for a metal tube oscillograph, and D of very short focus for a high-magnification electron microscope. In all four the focus is adjustable by variation of the voltage of one electrode, or the current in the coil. Electron lenses could be used for magnifying purposes like glass lenses. The sectional elevation in Fig. 8 shows the general arrangement of a practical electron microscope (*see* Electron Microscope) in which the three lenses are electromagnets like D in Fig. 7. They have the same functions as in the light microscope, with a condenser to illuminate the object, then an objective, and finally an eyepiece or projector lens; the last projecting the enlarged image on the fluorescent screen or photographic film. The results so far obtained by the electron microscope have been sensational. Typical examples are shown in Figs. 9 and 10.

**Television.** A cathode ray tube with a condenser lens like A in Fig. 7 and two pairs of deflectors at right angles to each other can function as a television receiver;

for the spot can be moved in a series of contiguous parallel lines to cover the whole picture space in  $\frac{1}{25}$  sec., and its brightness can be varied from maximum to zero by varying the voltage applied to the cathode shield (Fig. 7A). Tubes with screen diameters of 6, 12, or 18 ins. are used in practice. The transmitter is essentially the converse of the receiver, incorporating an electrically sensitive screen upon which the optical camera lens projects the original scene.

**Electronics.** THE INSTITUTION OF. Founded in 1930 by scientists and engineers who were interested in the applications of high frequency electricity, particularly in the field of telecommunications. The study of the electron from the standpoint of the physicist and the theory and practice of electrotherapeutics became matters of importance to members, and so the scope of the institution was widened. Membership is classified according to the special interests of members in physics, applied electronics, and electrotherapeutics. Incorporation was granted on Aug. 28, 1935.

**Electron Microscope.** The electronic equivalent of the light microscope, the comparison between the two optical systems being illustrated in Fig. 1, where a typical electron instrument is shown on the left, and a light microscope projecting its magnified image downwards on the right. Three lenses are required in any microscope: a condenser to concentrate the illumination upon the object, an objective to give an enlarged image of the latter, and an eyepiece or projecting lens to produce a further enlargement of



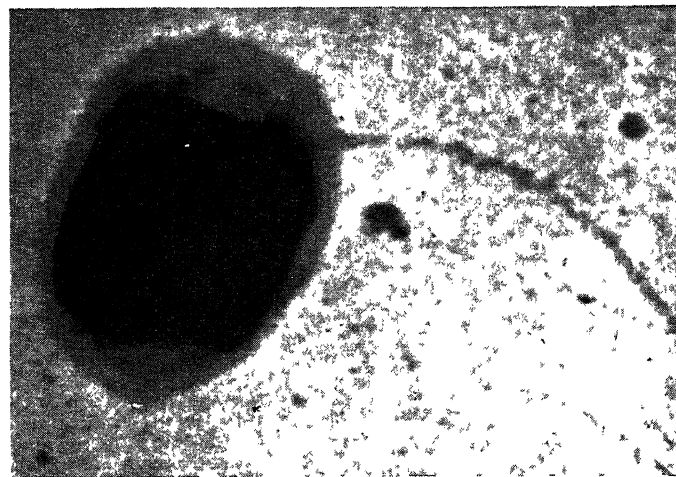
**Electron Microscope.** Fig. 1. Optical systems of electron (left) and light (right) microscopes

a fluorescent screen, instead of the retina of the human eye or a ground-glass screen, receives the final image. An example is shown in Fig. 2.

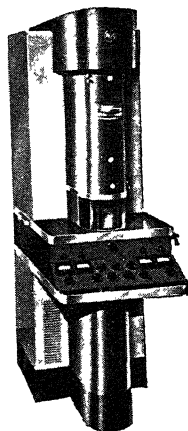
The useful magnification which can be given by the electron microscope is about 100,000 times as compared with 1,000 times for the light microscope. The reason for this is that details cannot be distinguished which are smaller than half the wave-length of the illuminant, and visible light reaches the limit at 1,000 magnifications. As the wavelength of the electron beam employed is about  $10^{-5}$  that of light, an improvement of  $10^5$  times is in theory possible. *See* Electronics.

**Electrophorus.** Simple electrostatic machine or generator of electricity. It was invented by the Italian scientist Alessandro Volta in 1775, and consists of a metal dish called the sole-plate; a layer of some good non-conducting substance, such as resin, glass, india-rubber, ebonite, or pitch; a metal disk, called the cover, rather smaller than the sole-plate; and an insulated rod attached to the disk and serving as a handle by which it may be lifted.

In using the apparatus the parts are usually first warmed to ensure that they are dry, and the resin base is then struck or rubbed

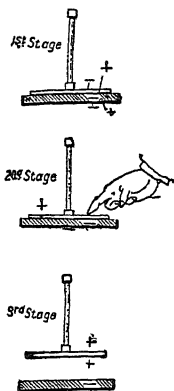


**Electronics.** Fig. 10. Typhoid bacterium showing flagellum. Magnified  $\times 66,000$



**Electron Microscope.** Fig. 2. R.C.A. electron microscope showing large ports above instrument desk for viewing second image

with a piece of cat's-skin or other fur, or a piece of dry woollen cloth, and is thus electrically excited,



Electrophorus, the simplest electricity maker. For explanation see text

the charge of electricity developed upon it being negative. The metal upper plate is then placed on the resin base; it does not, however, receive from the resin any direct charge of electricity, but by induction develops a charge of positive electricity on the surface of the disk where it is in contact with the resin,

and a charge of negative electricity on the upper surface of the disk, as shown in the sectional illustration. If now the upper surface of the disk be touched with a finger and thus put into electrical contact with the earth, the negative charge of the disk will pass to earth leaving the disk positively electrified throughout; and if lifted away from the resin the disk will give a spark if the knuckle or any conductor be brought near it.

The sole-plate performs an important function by the mutual induction which takes place between it and the upper plate or cover. When the latter develops its positive charge on being put in contact with the earth, the sole-plate receives a corresponding negative charge from the earth, and in this way the original positive charge of the cover due to the negative charge of the resin base may become an appreciable amount. Providing insulation is good the electrophorus may be worked almost indefinitely, i.e. every time the cover is put back on the base and its surface touched with the finger the action takes place and a spark may be obtained when the cover is lifted.

**Electro-Plating.** The deposition of a metal on another substance, usually another metal, by electro-chemical action, either for the purpose of protecting the latter metal from corrosion, as when iron is electro-plated with copper, or for the purpose of giving the appearance and some of the properties of one more costly, as

when a teapot of base metal is plated with silver.

The scientific principle upon which the art is immediately based is described under Electrolysis. The operation can be carried out on a domestic scale with small and simple apparatus; but when carried out on a commercial scale a large vat or bath is used, constructed usually of stout wood lined with lead or slate, though sometimes asphalt or cement is used, or the vat may be built of enamelled iron. It is usually rectangular in shape, and is fitted with a flange round the top, to which are attached two rectangles made of brass tubing, one being a little larger all round and fixed a little higher than the other, as shown in the illustration. The rectangles, and the vat itself, are insulated both from one another and from the earth.

#### Composition of the Bath

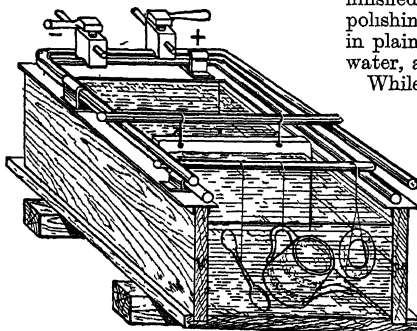
The outer ring is used to take the current into the vat, and is known as the anode ring; the current passes out through the other rectangle, the cathode ring. The bath is filled with a solution which varies according to the nature of the work to be done. Electric current is furnished by a dynamo which gives a large current at low voltage. The articles to be plated, when of convenient size, are suspended in the solution by means of wires from crossbars resting on the cathode ring; while plates of the metal which is to be deposited on the articles are suspended from similar bars resting on the outer or anode ring. The arrangement enables many articles to be placed in one vat together with an appropriate number of anode plates, which may be disposed along the brass rectangle as most convenient.

A simple example will serve to illustrate the entire process, whatever the metal that is to be deposited. Suppose that a teapot of

pewter or other alloy is to be plated with silver. The teapot is first highly polished by rotating "bobs" covered with felt and carrying an abrasive compound, and then by "mops" of linen. It is made chemically clean, by hand scouring, or caustic potash or soda, or pickling in acid, followed by hot water swills; it may be "degreased" by a solvent such as petrol or trichlorethylene. An operation known as "quicking" sometimes follows; the teapot is dipped in a solution of cyanide of mercury which forms a thin deposit of mercury on the surface, this facilitating the silver deposit and giving better adhesion. The teapot is suspended in the vat from one of the crossbars of the cathode ring, as shown in the figure. The solution is prepared from cyanide of potassium and cyanide of silver precipitated from nitrate of silver, in water. It contains  $1\frac{1}{2}$ –3 oz. of silver to the gallon.

The anode plate is of commercially pure silver; it is, of course, connected with the positive terminal of the dynamo or battery. When the current passes, the silver in the bath is thrown out of solution and deposited on the teapot, while at the same time an equal amount of silver is dissolved off the anode plate, and, entering into solution in the bath, takes the place of that deposited on the teapot. The process goes on so long as the current is maintained, until the anode is entirely dissolved or until as much silver has been deposited on the teapot as desired. The time occupied ranges from two to twelve hours or longer. The amount actually deposited on such an article as a teapot is about  $1\frac{1}{2}$  oz. per sq. ft. of surface covered, the thickness of ordinary writing paper. The teapot, as it leaves the bath, has a fine granular-looking surface of chalky whiteness. The smooth, bright surface of the finished article is given by further polishing after a thorough washing in plain water, dipping in boiling water, and drying in hot sawdust.

While silver is frequently used for table-ware, etc., copper, nickel, and chromium are in common use for decorative work. Cadmium, replacing nickel, is frequently used unpolished for anti-rust protection of steel screws. Zinc, tin, and lead are electro-plated for protective purposes. Palladium and rhodium will



Electro-plating. Diagram showing how articles are electro-plated with silver

provide an untarnishable skin on silver. All these processes are similar in principle to that already described for silver. Often the desired result cannot satisfactorily be obtained directly without a preliminary plating of another metal. Steel before nickel-plating frequently receives a first coat of copper. Chromium is usually deposited over nickel.

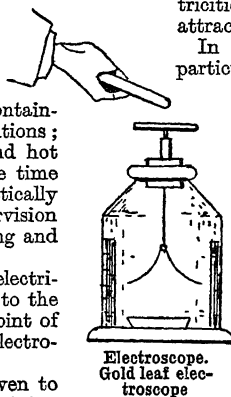
Electro-plating is a complex art, and many different methods and baths are in use. Improving technique constantly enhances the quality and adhesion of a deposit; the speed of deposition; the reduction of expense; and the omission of preliminary coats of other metals. Much work is carried out automatically, the parts to be plated being loaded on to a moving conveyor, which carries them down a line of tanks containing the various cleaning solutions; the actual plating bath, and hot and cold water swills. The time spent in each bath is automatically controlled, and little supervision is required except for loading and unloading.

**Electro-Positive.** In electricity, positive usually refers to the source of current flow, or point of higher potential. See Electro-Negative.

**Electroscope.** Term given to an instrument for determining whether a body is electrified or not, and if so, the character of the electrification, whether positive or negative. In its simplest form it consists of two small balls of pith suspended by silk threads from the arm of a metal stand, as shown below. An almost equally simple form is represented by the balanced needle, similar to the needle of a mariner's compass, devised by Dr. Gilbert of Colchester in 1600.

The electroscope usually consists of a glass bell jar commonly fitted with a brass ring round the bottom or fitted to a wooden base so as to be easily removable. The jar has a stopper of ebonite in which is fitted a stout brass wire with a removable plate or ball at the top, and from the bottom of which two strips of gold or

aluminium leaf depend. Opposite each strip and within reach of its end is a strip of tin foil attached to the interior surface of the jar. A glass rod, electrically excited by having been rubbed, if brought near the instrument will cause the leaves to repel one another; in favourable conditions so sensitive is the instrument that the leaves will begin to move apart while the glass rod is several feet away. What happens is that the electricity on the rod attracts the opposite kind into the plate or knob of the electroscope and repels the same kind into the leaves, which fly apart in accordance with the well-known law that like electricities repel and unlike attract.

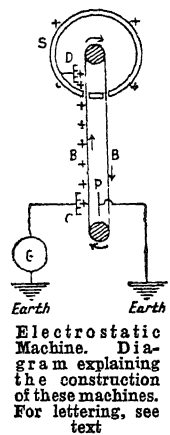


is to be determined be brought near the plate and the leaves diverge still farther, the body is electrified positively; if the leaves close, it has a negative charge. The strips of foil on the sides of the jar prevent the leaves from being damaged by the violence with which they are repelled or from adhering to the sides of the jar. The instant the leaves touch the foil they lose their charge to the earth, and fall back into their normal positions.

Whereas the electroscope is used to determine whether a body is electrified and the kind of electricity with which it is charged, a more developed instrument to measure potential difference is the electrometer (*q.v.*).

**Electrostatic Machine.** Machine for the conversion of mechanical work into electric energy. There are two kinds, frictional and influence machines. Ramsden's plate electrical machine belongs to the former class, and Wimshurst's well-known apparatus to the latter. Machines to produce two million volts or more have been designed by van der Graaf and others. They consist essentially (see illus.)

of a belt BB of insulating material upon which charges are sprayed by means of a "comb" C, which is connected to a unidirectional potential difference of 20,000 volts provided by the generator G. The charges are carried up by the moving belt BB into the inside of a hollow conducting but insulated sphere S, which collects the charge through the action of the collecting comb D. P is an earthed metal plate.

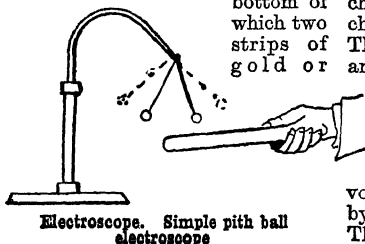


**Electrostatics.** Term applied to that branch of the science of electricity which is concerned with electricity at rest or with electric charges, and is particularly occupied with the measurement of such charges. The science deals alike with the most elementary facts of electricity such as the phenomena exhibited by a rubbed glass rod, and with the profound problems associated with the electrical relations of atomic particles.

**Electrotherapeutics.** The application of electricity to medicine. When the idea arose that electricity was a vital force, it was first recognized as a force that kills. The conception that it would cure the physical ills of man came later. Unfortunately a good deal of charlatanism has been associated with the study of the curative powers of electricity. Thus, magnetism alone has no physiological action; any curative effects which magnetic appliances produce are due not to electric power, but to the warmth which they communicate to the body of the patient and to the faith which they inspire in him.

In 1678 Swammerdam showed that a muscle of a frog's leg hanging by a thread of nerve, bound with silver wire, would instantly contract if nerve and wire were simultaneously touched by a piece of copper. Galvani and Volta a century later excited general scientific interest in the physiological effects of electricity by recording this same experiment.

In practice, electricity is used in the following forms: low frequency—faradic, galvanic, sinusoidal; high frequency—short wave and long wave diathermy.





*Faradic current* has the power to make a muscle contract and is used to bring increased tone to a weakened muscle. It is especially useful in after treatment of sprains and fractures, in paralysis, and in post-operation conditions. The faradic battery is used to test the degree of impaired innervation of a damaged muscle or muscle-group, when, in conjunction with the galvanic current, it is often possible to calculate the degree of damage by the varying response, or comparative reaction, to these two currents. Ions of substances of curative value such as histamine, sodium salicylate, or potassium iodide, can be introduced into a localised area by a direct *galvanic current*, some under the positive electrode, some under the negative electrode, according as the substance is electro-positive or electro-negative. The active pad of sixteen thicknesses of lint wrung out in ordinary tap water, in which is a varying low percentage of the substance to be used, is placed over the affected part and the indifferent electrode placed so that the electrical current passes directly through the part to be treated. A drug can thus be directed to a localised area.

*Sinusoidal current* is used as a general stimulant to increase circulation. Typical conditions treated are chilblains, venous congestion, and stages in infantile paralysis.

The above three currents can each be given to a single limb or to all four limbs through a water bath. This is known as Schnee bath treatment. If the water is heated and given a whirlpool effect, the treatment is reinforced.

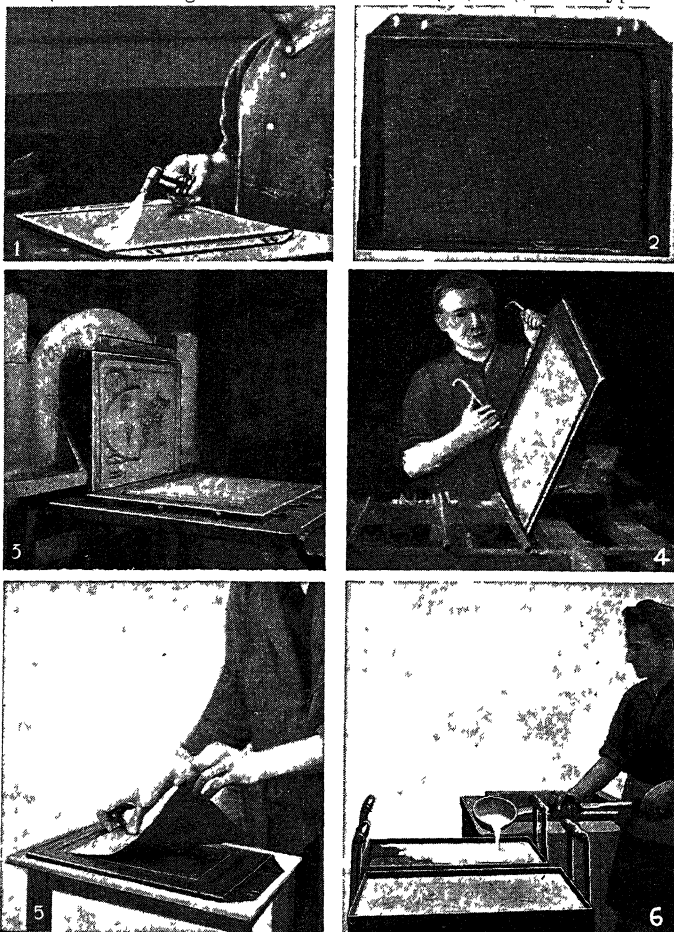
#### Diathermy Treatment

Diathermy is used where a deep heating effect is desired. The word suggests heating through, whereas radiant heat is diffused. Diathermy treatment has direct impact on sick tissues; it is useful in disorders of the rheumatic group, pain following injury and internal low grade infection, and most inflammatory conditions, e.g. sinusitis, shingles, boils. Short-wave diathermy has now almost entirely superseded long-wave. Ultra-violet light radiation can be obtained from a quartz burner or a carbon arc. General sunlight baths probably benefit sufferers from debility, though it is difficult to reconcile statistics with this statement. Artificial sunlight falling upon skin disinfects the surface from germs and increases the activity of cells beneath the

skin. It synthesises vitamin D, as does natural sunlight, by action on the cholesterol found in the skin. It is used as a counter-irritant in obstinate neuritis.

Electricity is also used to illumine certain cavities of the body, such as the lower bowel and the bronchi; minute lamps are fixed to delicate instruments with a complicated arrangement of mir-

metal deposited does not become an intrinsic portion of the article on which it is laid, but is removed from the latter after it has been deposited; its object is not to encase or permanently cover one metal with another, but to make a copy of a surface. It is largely used for making reproductions of coins and medals and other works of art, and for preparing electrotypes for



Electrotyping. 1. Smoothing out the wax. 2. Wax mould in position. 3. Wax impression from block. 4. Copper shell on mould taken from electrolytic tank. 5. Peeling shell from mould. 6. Pouring in backing of molten lead

rors, allowing of the examination of the parts by the surgeon. The electric needle can destroy the roots of disfiguring hairs, and even remove warts and moles. Powerful electro-magnets pull particles of metal out of the eye. X-rays (*q.v.*), while not strictly electrical, are indirectly so, being a secondary product of electric action.

Hilary Ledgerwood, M.B.

**Electrotyping.** Particular form of electro-deposition. It differs from electro-plating in that the

printing, both from type matter set up in the usual way and from engraved surfaces in wood or metal. Fine half-tone blocks for illustrations are duplicated in this way. Electrotypes is the term given to the product.

If a reproduction of a medal is required, and the original is not too valuable to be risked in the depositing solution, it can be used as the cathode of the operation. It is prepared by having a wire twisted round its edge, leaving sufficient

length for attaching to the terminal of the electric battery or machine. The face which is not to be copied is embedded in gutta-percha; the face to be reproduced is slightly greased with olive oil by a fine hair brush, to prevent a too powerful adhesion of the deposited metal, after which the medal is ready for the bath.

The solution is prepared according to the metal to be deposited, usually copper; after 12-24 hours the deposit will have acquired the necessary thickness, probably about 0.015 in., and the medal will be removed from the bath, when the electrotype can be detached. If now a mould be taken of this electrotype, and then another electrotype taken off that mould, the second electrotype will be a duplicate of the face of the original medal. A duplicate of the other face of the medal being obtained, the two halves can be trimmed and soldered together, making a complete reproduction of the original. In this way copies of rare or historic coins and medals in museums have been made.

If the original coin or medal is too precious to be risked in the electrotype bath a plaster cast will be prepared, or a mould in gutta-percha by the aid of pressure.

#### Electrotyping from Type

A similar moulding process is necessary in the preparation of an electrotype from a forme of type. The type is first thoroughly cleaned, dried, and blacklead. A shallow tray is filled with a molten mixture of beeswax, Venice turpentine, and graphite, and the surface, when set, blacklead. The forme of type is then forced into this mixture by pressure and a mould thus produced. This mould is coated all over with graphite, and has a copper wire embedded in it all round the impression which is to be reproduced in order to increase the conductivity of the mould when in the bath, the wire being connected with the terminal of the vat, in which the mould becomes the cathode.

The anode is a plate of copper and the solution is acidified copper sulphate. A powerful current is used to give a rapid deposition and secure the necessary thickness in the shortest possible time. When the electrotype is finished in the bath it is removed and separated from the wax bed by melting the latter in hot water, after which it is laid face down on an iron plate, heated, surrounded by a frame of iron bars; and molten "back-

ing" metal, consisting of lead hardened with a little antimony and tin, is poured over it to a depth of from  $\frac{1}{4}$  to  $\frac{3}{8}$  in. It is then tamped up on a steel plate by hammering till perfectly flat, trimmed, and mounted on a wooden block to make it "type high"; or if it is to be used on a rotary printing machine it is bent by rollers to the required curvature. If many impressions are to be taken the electrotype so prepared can be "steel faced" by having a deposit of iron given to it by a separate operation in an electrolytic bath.

Improvements in stereotyping deprived the electrotype of some of the value which at one time it possessed; and a process of plastic moulding, in which the mould is obtained by a combination of pressure and heat in a thermoplastic material such as vinylite, was an improvement on the wax moulding and blackleading method. The plastic mould is rendered electrically conductive for the deposition of the copper by a thin coating of silver, which is put on by spraying the mould with solutions of the necessary chemicals.

**Electrum.** Term applied at various times to different materials. In ancient days it was given to amber; in the Middle Ages to brass; more recently to an alloy of copper 8 parts, nickel 4, and zinc 3.5 (sometimes the nickel is 6 parts), a beautiful artificial silver with a bluish tint much used for the manufacture of drawing and other instruments; also to an alloy of copper, zinc, and tin, and to native minerals containing gold and silver, the latter 20-50 p.c. An alloy of gold and silver (15-35 p.c. silver) known by this term, of a pale yellow colour (hence the association of the material with amber), was much used by the early Greeks and Romans for ornaments and coins. The earliest coins known were made of it. Rods having 651 parts gold and 334 silver in 1,000 were used as money in Asia Minor.

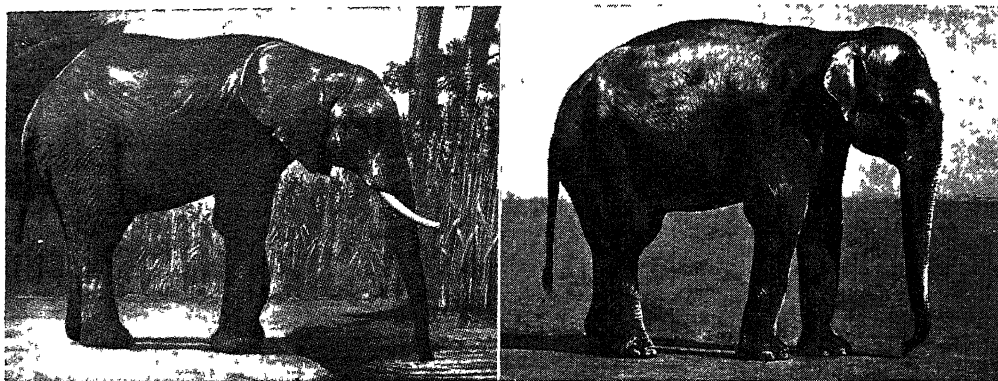
**Elegy** (Gr. *elegos*). Originally a threnody or lament written in elegiac metre, each couplet in which consisted of a hexameter and a pentameter. The theme of such songs varied, the term being employed for the form rather than the spirit. In modern literature the elegy has mostly been associated with the spirit rather than the form, and has come to be understood as a short mourning, or memorial song, usually a tribute to an individual, but sometimes of a more generally mournful character,

as is Gray's *Elegy Written in a Country Churchyard*, 1751.

Earlier poets used the term with wider significance, as when Donne described a series of his amatory poems as *Elegies* and labelled his memorial poems specifically *Funeral Elegies*. Although there were earlier memorial poems of distinction, such as the beautiful anonymous *The Pearl* (14th century) and Chaucer's *Book of the Duchess* (c. 1369), these can hardly be strictly described as elegies owing to their length and treatment. Some of the more notable elegies in English are Spenser's *Daphnida*, 1591 (on Lady Douglas), and *Astrophel*, 1595 (on Sir Philip Sidney); Milton's *Lycidas*, 1638 (on Edward King); Shelley's *Adonais*, 1821 (on John Keats); Tennyson's *Ode on the Death of the Duke of Wellington*, 1852 (his *In Memoriam* is rather a series of elegiac poems than an elegy); Matthew Arnold's *Thyrsis*, 1867 (on Arthur Hugh Clough); Swinburne's *Ave Atque Vale*, 1867 (on a false report of Baudelaire's death); and William Watson's *Lachrymae Musarum*, 1892 (on Tennyson). See *Poetry*.

**Elektra.** Opera in one act by Richard Strauss, with text based on Sophocles's drama by Hugo von Hofmannsthal. In this work Strauss reached his climax as one of the most complex of composers (in his next work, *Der Rosenkavalier*, he returned to simpler forms). The musical characterisation in *Elektra* is masterly, and the opera is one of the most dramatic in the Strauss repertory. First performed at Dresden, Jan. 25, 1909, it was produced at Covent Garden under Beecham the following year.

**Elektron Alloys.** A group of light alloys with a magnesium base and varying amounts of aluminium, manganese, and zinc. Aluminium is added up to 10 p.c. to increase the strength; zinc up to 4 p.c. enhances this effect;  $\frac{1}{2}$  to  $2\frac{1}{2}$  p.c. manganese improves resistance to corrosion. Up to 1 p.c. cerium improves the mechanical properties at raised temperatures. Elektron alloys, being the lightest commercial alloys known, are used for aircraft engine parts, landing wheels, airscrews, etc., and for gear cases and parts of motor cars. They may be cast or wrought hot, but not cold. Some heat treatment and ageing are necessary to produce the optimum properties, but they are never quite so strong as best aluminium alloys. They are best joined by



Elephant. Left, African elephant, valuable by reason of its ivory tusks. Right, Asiatic elephant showing the whitish markings characteristic of this species

Photo of Asiatic elephant by Gambler Bolton, F.Z.S.

gas welding or the argon arc process. See Electric Welding.

**Elemental Spirits OR ANGELS OF THE ELEMENTS.** Spirits supposed to rule over the four elements of fire, water, air, and earth. The Jewish Kabbalists and the Gnostics of early Christian days largely developed this idea and introduced a host of minor angels or spirits who had charge of departments of the four great elements, such as wind, rain, etc. Hence arose an elaborate system of angelology not unlike demonology, but generally beneficial. In the Middle Ages, the spirits of fire were known as Salamanders; those of water as Nixies or Undines; those of air as Sylphs; those of earth as Gnomes. The name Salamander survives as that of a batrachian reptile supposed to be capable of living in fire.

**Elementary Flying Training School.** R.A.F. establishment for training air crews. After their training in ground subjects at an Initial Training Wing air crew personnel pass to an E.F.T.S., where they not only learn to fly primary training aircraft, but also receive instruction in navigation, photography, armament, bombs, and night and blind flying.

**Elements.** In chemistry, the ninety-odd substances from which all solids, liquids, and gases are constructed. See Chemical Elements; also table under Chemistry.

**Elements.** In astronomy, a set of seven numerical quantities which specify completely the orbit of a planet, comet, or double star and enable its position to be calculated for any given time, past or future. Five of the elements define the size, shape, and orientation of the orbit; the other two suffice to locate the object in the orbit.

**Elemi.** Resinous exudation from a number of tropical plants,

especially *Canarium luzonicum*, a tree growing in Manila. The resin is of a pale yellow colour resembling stiff honey in consistency. It has an odour which reminds one of fennel. Elemi was formerly used in medicine as a stimulating application to wounds. The ointment contains about 20 p.c. elemi.

**Elephant** (Gr.-Lat. *elephas*). Family of large, hoofed mammals, surpassing in size all existing mammals. Only two species now survive, the African (with large ears and small eyes) and the Asiatic (with small ears and large eyes), though several others are known in the fossil state. The feature which distinguishes the elephant from all other mammals is the development of the nose into a long flexible trunk, used by the animal in conveying food to the mouth, and also for drawing up water which is afterwards squirted down the throat.

In dentition the elephant is unique. The incisors, which are found only in the upper jaw and are two in number, are developed in the male, sometimes in the female also, into a pair of long curved tusks. These tusks are quite different from those of the boar and other animals, which are simply large canine teeth. The elephant has no canines. Only two cheek teeth or molars, on each side of both jaws, are ever in use at any one time. These teeth are of great size, probably compound, and the surface consists of a large number of transverse ridges of enamel, parallel in the Indian and enclosing lozenge-shaped spaces in the African elephant. As these molars become worn out they are replaced by the reserve teeth, which grow through the gum.

The ponderous body of the elephant is encased in thick wrinkled

skin, covered sparsely with coarse hair in the young animal but almost bare in the adult. The legs are massive, and the knee joints are much lower down than in most hoofed animals. This causes the elephant, when lying down, to rest with the hind legs bent, while the fore legs are thrust out in front.

The head is enormous, and suggests the presence of a large brain. The brain is actually small for the size of the animal and is placed at the back of the head, the huge skull consisting of a mass of bone completely honeycombed by cells, an arrangement which provides for the attachment of the jaw and trunk muscles without making the skull so heavy as to be a burden.

Elephants are entirely vegetarian, feeding on leaves and twigs and on grass which they gather by the aid of their trunks. Trees are often uprooted by pressure with the head for the purpose of feeding on the branches. Where force is required, the elephant relies upon leverage with the tusks or pressure with the skull. The trunk is a delicate sense organ for smell and touch, and the animal is careful to keep it out of the way of rough usage. When an elephant holds a heavy weight it rests it on the tusks or holds it with the teeth, using the trunk only to steady it.

The Indian elephant is easily distinguished by its massive bulbous head, small ears, and the presence of four nails on the hind feet. It is dark grey, but occasionally more or less blotched with white. This elephant is rarely much more than 9 ft. high at the shoulder. It has been known to live in captivity for over a century, and in the wild state probably attains a much greater age.

The African elephant has a smaller and narrower head, large

fanlike ears, and only three nails on the hind feet. Its trunk has two finger-like processes instead of one. It also attains a greater height, has longer legs, and a generally less heavy and clumsy appearance. Owing to continuous destruction for the sake of its tusks, the African elephant has been greatly reduced in numbers. This is of more savage disposition than the Indian species. Economically the African elephant is valued for its ivory, the Indian as a draught animal.

**Elephant.** Island of the South Shetlands, Antarctica. The most northerly of the group, it lies S.E. of Cape Horn and Drake Strait.

**Elephant, ORDER OF THE.** Danish order of knighthood refounded

in 1458 from an earlier institution, and remodelled in 1693. It is limited to 30 knights, exclusive of the sovereign and his sons, and is conferred only upon Protestants. The



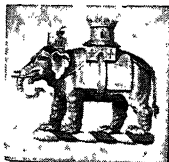
Order of the Elephant. Danish badge of knighthood

badge is a white elephant; the ribbon is of light blue watered silk.

**Elephanta** OR GHARAPURI. Island in Bombay Harbour, India. From 4 m. to 4½ m. in circumference, it consists of two long hills. It was so called by the Portuguese from a large stone elephant. The island is famous for its caves or rock temples, supposed to date from the 9th century. See Cave Temple illus.

**Elephant and Castle.** Design found in early MSS. and in medieval times. Elephants carrying

armed men into battle were used in the East from immemorial days. They were first encountered by the Romans during the war with Pyrrhus in the 3rd



Elephant and Castle badge

cent. B.C. Polyænus records that an elephant carrying archers in a houdah led the advance when Julius Caesar forced the passage of the Thames near Chertsey in 54 B.C.

Caesar Frederick, a Venetian merchant of the 16th century, states that the king of Pegu had 4,000 war elephants with castles on their backs, and the Cutlers' Company, who had a large trade in ivory, adopted the animal so castled as their crest.

**Elephant and Castle.** London tavern in the met. bor. of Southwark, 1¼ m. S. of Ludgate Hill.



Elephant Apple. Leaves, flower, and fruit, showing arrangement of seeds within the fruit

The tavern stands at a point from which six thoroughfares radiate: New Kent Road, Walworth Road, Newington Butts, St. George's Road, London Road, and Newington Causeway. It gives its name to a district (heavily damaged by German bombs in 1940) and to two rly. stations, one being a terminus of the Bakerloo tube rly.

**Elephant Apple** (*Feronia elephantum*). Large evergreen tree belonging to the family Rutaceae. A native of Coromandel, it has glossy leaflets and white flowers. The fruit is as large as an apple, with a hard, woody rind containing seeds embedded in pulpy flesh. The pulp is eatable and is made into a jelly; it is also useful in dysentery and diarrhoea. The wood is hard and heavy but not durable. The tree exudes from wounds a gum which forms a constituent of what is known as Indian gum-arabic.

**Elephantiasis** OR BARBADOS LEG. Disease characterised by chronic inflammation of the fibrous connective tissue, resulting eventually in excessive swelling of the leg, scrotum, arm, or breast, and less frequently other parts. The condition is due to obstruction of the lymph circulation by mechanical and inflammatory causes, the result of infection by a parasite worm, the filaria. The disease, which was recognized in ancient times, probably originated in



Elephant's-foot. Leaves and flowers of the S. African climber

Asia, and has spread thence to Africa, America, India, China, and Japan. Its distribution is influenced by that of mosquitoes, but the exact conditions governing its transmission have not yet been determined.

Elephantiasis frequently begins with high fever, pain in various parts of the body, and swelling of the extremities. The swelling may abate after the first attack, but in subsequent attacks the limb becomes more and more swollen until eventually it may attain an enormous size. Treatment is not very satisfactory. Castellani and Chalmers state that the best results are obtained by keeping the patient in bed and injecting fibrolysin daily for three to six months.

**Elephantinē.** Island in the Nile at Assuan, Upper Egypt. Marking the S. limit of ancient Nile navigation, it contained the Old Kingdom frontier station, Abu, or elephant town, an *entrepôt* of the Sudanese ivory trade. On the W. Nile bank opposite are rock-hewn tombs of Old and Middle Kingdom governors. Under Thothmes III, Rameses II, and other kings, its governor controlled the Assuan granite quarries. During the Persian supremacy there was a Jewish garrison, with a temple of Jehovah here. Aramaic papyri, recovered 1901 and 1906-08, elucidate 5th century life. An interesting object is the nilometer, recently renovated, which dates from the Ptolemaic period.

**Elephant Seal** (*Macrorhinus*). Large species of seal. It is called sea elephant because the nose is



Elephant Seal. A large marine animal found in the Indian and Southern oceans. It is also called the sea elephant

prolonged into a short proboscis in the adult male. Large specimens attain a length of 20 ft., and the girth is about equal to the length. These animals are found only in the Indian and Southern oceans.

**Elephant's-foot, HOTTENTOT BREAD, OR TORTOISE PLANT** (*Testudinaria elephantipes*). Perennial climbing herb of the family

Dioscoreaceae. It is a native of S. Africa. The huge rootstock (as much as 4 ft. across) is covered with a corky bark, ultimately cracked into angular protuberances. It contains a store of starch, eaten by the Bushmen. The slender stems climb to a height of 30-40 ft., and bear small heart-shaped leaves and sprays of tiny greenish-yellow flowers.

**Elephant Shrew** (*Macroscelides*, long-legged). Name sometimes given to the jumping shrew, owing to its long and trunk-like nose. They are small African insectivores and have the hind legs so long in proportion to the body that they look rather like miniature kangaroos. They are nocturnal in habit, feed mainly on insects, and proceed by a series of leaps.

**Elephas Primigenius** OR MAMMOTH. One of the extinct elephants, almost identical with modern elephants, but differing in greater development of curly tusks, and in the woolly hair. It was far more widely distributed than the modern elephant, remains being found in America, the bed of the North Sea, the Thames Valley, within the Arctic Circle, and in the frozen earth of N. Russia. See Mammoth.

**Eleusine.** Genus of grasses of the family Gramineae. Natives of warm regions, they are distinguished by the flower spikes being arranged finger-fashion at the top of the stem. As a genus they are of little importance, but



Eleusine, showing the finger-like flowers

*E. coracana* is grown in Japan and on the Coromandel coast, its large seeds being used as corn.

**Eleusinia** OR ELEUSINIAN MYSTERIES. Festival held in honour of the nature goddess, Demeter, more especially that held at Eleusis in Attica in Sept. each year. Only those who were properly initiated were allowed to take part in the rites. The precise nature of the rites is not known, as they were never divulged in ancient times, though the festival continued till nearly A.D. 400. They were doubtless symbolical of the death of Nature in autumn and its rebirth in spring. See Demeter; Mystery.

**Eleusis.** Ancient city of Attica. Said to have been founded by Triptolemus (q.v.), it stands on

the Bay of Levsina, 12 m. N.W. of Athens, with which it is still connected by the old causeway called the Sacred road. It was the chief seat of the worship of Demeter, in whose temple the Eleusinia were performed. During the Persian Wars this great temple was destroyed, but soon rebuilt, additions being made by Pericles, and later by Demetrius Phalereus. Still further enlarged by the Romans, the city continued intact until it was destroyed by the Goths under Alaric in A.D. 396. Eleusis was the birthplace of the great tragic poet Aeschylus, and after the Peloponnesian War its citadel was seized by the remnants of the Thirty Tyrants (q.v.). Though the site is strewn with ruins, little of the temples but two porches remain, with a sacred well, a council hall, and lesser temple. Eleusis, later Eleusin, is now represented by the village Levsina, lying 15 m. by rly. N.W.

of Athens, chiefly inhabited by people of Albanian stock.

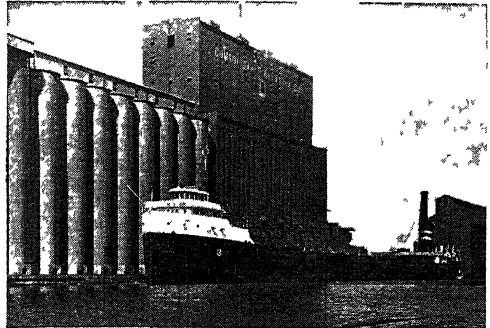
**Eleuthera.** Island of the Bahamas. It is 50 m. N.E. of New Providence, and is separated from Great Abaco by the Providence Channel. Long and very narrow, it is fertile and produces cascarilla, oranges, pineapples, onions, and tomatoes. The capital is Governor's Harbour, with a good, fortified harbour. Area, 235 sq. m. Pop. 6,430.

**Elevation.** In architecture and engineering, a side or end view of an object or representation on a perpendicular plane; also an end or side view of a building or machine drawn to scale without reference to perspective. In astronomy, the angular height above the horizon of a star or other celestial object. In gunnery, the amount of movement of the axis of a gun in a vertical plane, and also an angle formed between the axis of a rifle or gun and a horizontal plane.

**Elevator** (Lat. *elevare*, to lift up). In aeronautics, one of the horizontal tail control surfaces of an aircraft. When moved upwards, the elevators cause the machine to rotate about a lateral axis in such a way that the nose is tilted up-

wards, and the aircraft climbs. When the elevators are lowered there is an opposite effect.

**Elevator.** A grain silo or store equipped with elevating apparatus for taking in and discharging the contents. The name is given also to a lift for materials, goods, or passengers (see Lift). The grain elevator (Fig. 1) contains a number of deep vertical bins, circular, hexagonal, or square in plan, and constructed of steel plates or reinforced concrete; and is equipped with elevating, cleaning, distributing, and discharging apparatus. On arrival the grain is emptied by means of

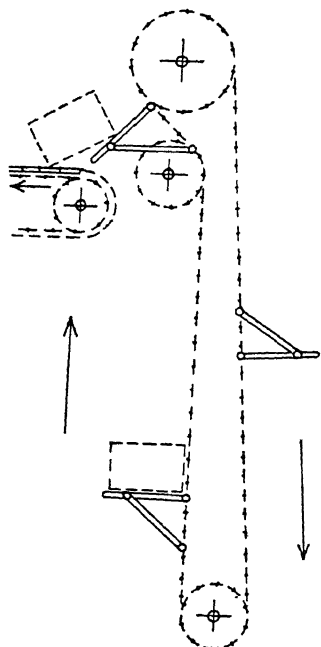


Elevator. Fig. 1. A lake freighter taking on a cargo from a grain elevator at Duluth, Minnesota, U.S.A.

a bucket or pneumatic elevator into a receiving chamber, whence it passes downwards, through an automatic weigher and a cleaning machine, to a bucket elevator, which carries it to the distributing floor at the top of the building. Here it is received on a system of belt conveyors and is rapidly delivered into one of the bins. These have conical bottoms and are self-emptying. Trucks are run under them and loaded directly, or the grain is transferred to ships by belt conveyors, or through spouts. The largest silos have a capacity of several millions of bushels; will take in 40,000-50,000 bushels an hour, and discharge 100,000 bushels and upwards in the same time.

The type for materials, etc. is in many respects like a conveyor (q.v.). Continuous chain and bucket elevators, either vertical or inclined, are used for handling coal in large boiler houses, delivering the coal into overhead storage bins, from which it flows through chutes to the boiler stokers. Fig. 2 indicates how a double-chain arm elevator can be used to raise bundles and deliver them automatically to a slat conveyor serving a store. A popular form

of machine for raising boxes in tall warehouses is the vertical swing-tray elevator, where the



**Elevator.** Fig. 2. Double-chain arm elevator used for raising bundles and delivering them to a flat conveyor serving a store

carriers are freely pivoted to two strands of Ewart chain. This type of package elevator is much used with gravity roller conveyors in warehouses and bottling stores.

**Elf.** Small being common to the folklore of most countries of northern Europe. Grimm says that an elf comes as much short of human size as a giant towers above it. The white elves are well formed and symmetrical, the black ugly and misshapen. The latter mostly work underground at their forges, and, like their white brethren on the earth's surface, take pleasure in teasing mankind. If left undisturbed they maintain peace with men and delight in doing them service; but if interfered with retaliate with mischief.

Elves were generally credited with wisdom and sometimes with divination. A common characteristic of the elf was his power of becoming invisible, frequently by means of a cloak or cap; thus, Siegfried in the Nibelungs' Song has an invisible cap which he obtains from Alberich, the elf-king. In most stories elves are peculiar to the earth and underground, and are scarcely distinguishable from the forge-working

dwarfs and gnomes of the mountains; while in others they are associated with light and flowers, and blend in the more general term of fays and fairies. There have been attempts to link the elf tradition with a primitive northern people of small stature.

Flint arrow-heads were called elf-arrows or elf-bolts from an idea that they were weapons of these little people. They are worn as amulets (ancient Etruria, Italy),

and reproduced for sale (Mecca). In Ireland water poured over them is given to cattle. Other things associated with them were elf-locks, hair matted together by them in mischief, or as they wore it; elf-child, a changeling; elf-knot, the hole in a piece of wood from which a knot has fallen, being the hole through which an elf can pass; night-elf, the nightmare; elf-light, will-o'-the-wisp; elf-lay, a fairy song. See Folklore.

## ELGAR: GREAT BRITISH COMPOSER

Basil Maine, Author of *Life and Works of Elgar*

*The life of the outstanding British composer of the early 20th century, who became also a notable figure in European music, told by his friend and biographer*

Edward William Elgar was born at Broadheath, a village near Worcester, on June 2, 1857. His father, W. H. Elgar, was a native of Dover, who settled in Worcester in 1841 and established a music

shop there; his mother was a native of the West Country, her maiden name being Anne Greening. As a boy, Elgar was surrounded by music and musical talk and activities. His father was organist of S. George's (Roman Catholic) church, Worcester, and as a violinist played in the orchestra at the Three Choirs' Festivals. Edward sometimes took duty for his father at the organ. He learnt to play the violin and the bassoon and was an active member of the Worcester glee club. For a time he worked in a solicitor's office, but all the time his mind was on music and every moment he could snatch was devoted to playing or to composition. Like his father, he was admitted to a place among the violins in the festival orchestra.

### Bandmaster and Composer

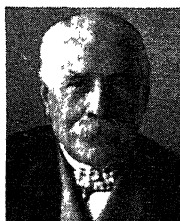
At the age of 20, Elgar went to London to have violin lessons. He was appointed bandmaster at the Worcester county asylum and in this capacity gained knowledge of rudimentary orchestration. The year 1883 brought him before the public as a composer; an intermezzo which he had written was performed at an orchestral concert in Birmingham. During these impressionable years there came his way the music of Emanuel Bach, and of those almost forgotten composers, Schobert and Kozeluch; also examples of Tudor church music, the masses of Haydn

and Mozart, Meyerbeer, the operas of a travelling company's repertory, together with Shakespeare and Voltaire. These impressions were assimilated only to give the composer's individuality a keener

edge; for, it can be confidently said, no composer's music is more immediately recognizable than Elgar's. Yet over half his life had passed before recognition came. Lack of encouragement made him diffident. He was approaching 40 before he became completely sure of himself. His marriage, in 1889,

to Caroline Alice Roberts, was a factor in this gradual self-assurance. Until her death in 1920, his wife played the part of encouraging companion. Her influence can be judged from the fact that Elgar wrote no important work after her death.

The completion of the choral and orchestral work, *King Olaf* (1896), served to give Elgar confidence in his powers, but it was not until the orchestral work known as *Enigma Variations*, was produced in 1899 with Hans Richter as conductor, that the wider public acclaimed his genius. Assurance was made doubly sure by the production in 1900 of the great oratorio, *The Dream of Gerontius*. This was soon given in Germany, and the event was a landmark not only in Elgar's career but also in English music; Elgar had joined English music to the main European stream. After *Gerontius*, there followed the oratorios, *The Apostles* (1903) and *The Kingdom* (1906), the first symphony (1908), violin concerto (1910), second symphony (1911), and the sym-



Sir Edward Elgar, British composer



phonic study, *Falstaff* (1913); and in each of these works, not to mention the introduction and allegro for strings and the cello concerto, Elgar establishes his claim to be ranked with the finest and most imaginative writers for orchestra.

When Elgar was at length accepted at his true worth (largely as a result of tributes from foreign musicians), honours came thick and fast. In 1904 an Elgar Festival was given at Covent Garden; the same year he was knighted; a year later Oxford made him an honorary doctor of music (he had already received an honorary degree from Cambridge), and he was appointed professor of music at Birmingham. During the war years beginning 1914, he, like other creative artists, was in a chastened mood. He turned to chamber music and also to work of a topical nature, such as *Carillon*, *Polonia*, and choral settings of verse by Laurence Binyon, called *The Spirit of England*. The 'cello concerto (1919) speaks of the sorrow which fills an artistic soul in time of war. In 1924 Elgar was appointed Master of the King's Musick.

#### Unfinished Symphony and Opera

After 1920 Elgar wrote no major work, although his free orchestrations of a fantasia and fugue by Bach and an overture by Handel, and the nursery suite for orchestra give abundant evidence of the master hand. His 75th birthday was marked by a festival arranged by the B.B.C. It was then that the public heard that the B.B.C. had commissioned a third symphony from Elgar, but this work was interrupted by a painful illness, and on Feb. 23, 1934, he died, leaving unfinished not only his symphony, but also an opera to be called *The Spanish Lady*, based on Ben Jonson's play, *The Devil is an Ass*.

There is no insularity in Elgar's music. The liberal distribution of tastes and attractions during his youth was evidence of his mind's great range. Not that his music was unconditioned by national environment. In that respect he is in the company of Beethoven, Brahms, and Sibelius. But like these, he was nationalist by grace, not by adoption of folk-song. Melodies that once were folk-music but are no longer—these he eschewed; especially in compositions which were deliberately patriotic in motive. Instead Elgar wrote melodies of his own, one of which (*Land of Hope and Glory*)

became a "folk-song" in his own lifetime.

Elgar's was always a symphonic way of thinking. The spontaneity and nervous energy of his most characteristic music demand that the orchestra should have a free hand. In the oratorios and cantatas there are occasional passages where the purely musical part of Elgar's mind, with its continual aspiration towards the larger freedom of symphonic thought, appears to be fretting under the burden of the text. Among the finest symphonic composers of history, Elgar's name shines because of his peculiar genius for orchestral writing, which, incidentally, helped to raise the standard of orchestral playing in England. Elgar was loved by English orchestral players. The memory of early days when he was himself a bandsman filled him with a sympathetic appreciation of their work. He was one of them. Unsparringly he devoted himself to making his music understood by them. They have proved themselves worthy. English orchestras do indeed know their Elgar, the idiom of his phrase, the curve of his eloquence, the secret of bowing his ecstatic melody and of breathing his rich harmony. *Consult* *Life and Works*, B. Maine, 1933; Elgar, W. H. Reed, 1936.

**Elgin.** Royal and mun. burgh and co. town of Morayshire, Scotland. It is 80 m. by rly. N.W. of



Elgin, Scotland. The western towers of the ruined cathedral

Aberdeen; Lossiemouth, its port, is 5 m. to the N., with its own railway station. Elgin has ruins of a beautiful cathedral, founded in 1224, burnt down in 1270, rebuilt, and again destroyed by fire in 1390 by the Wolf of

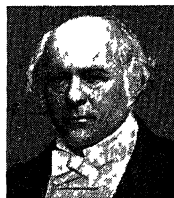
Badenoch. Restored to greater magnificence, it was wrecked by the fall of the central tower, 1711.

Remains exist of the bishop's palace, a royal castle, and monasteries of Blackfriars and Greyfriars; the Greyfriars chapel was restored by the third marquess of Bute. Woollen manufacture, iron-founding, and tanning are industries. A 40-acre park was presented by (Sir) George Cooper in 1903. Mkt. day, Fri. Pop. 10,571.

**Elgin.** City of Illinois, U.S.A., in Kane co. On the Fox river, which supplies power for the industrial establishments, it is 36 m. W.N.W. of Chicago by rly. It has a reputation for watches and butter, though production of the latter has declined in favour of milk-processing. Manufactures include bottling equipment, ovens, sewing implements, shoes, and thread. The academy of fine arts has a notable collection of American paintings. Settled in 1835, was granted a city charter in 1854. Pop. 38,333.

**Elgin, EARL OF.** Scottish title held by the family of Bruce since 1633. Sir Edward Bruce, master of the rolls under James I, was made a baron in 1601, and his son Thomas was made earl of Elgin and later an English baron. The 2nd earl was made earl of Aylesbury in 1663. In 1746 the direct line failed, and there was a division of the titles, the earldom of Elgin passing to Charles Bruce, 9th earl of Kincardine, whose successors have borne the double title. Thomas Bruce, 7th earl of Elgin and 11th earl of Kincardine, a general in the army and ambassador at Brussels, Berlin, and Constantinople, is remembered as the collector of the Elgin Marbles (*q.v.*). The 10th earl (b. 1881) succeeded his father in 1917. The family seat is Broomhall, Fife, the earl's son is known as Lord Bruce, and the earl sits in the house of lords by virtue of a barony created in 1849. *Pron.* Elg-in.

**Elgin, JAMES BRUCE, 8TH EARL OF** (1811-63). British diplomatist. Born in London, July 20, 1811, son of the 7th earl, whom he succeeded in 1841, he was governor of Jamaica 1842-46, and governor-general of Canada 1846-54. He was raised to the British peerage in 1849. In 1857 he went as envoy



8th Earl of Elgin, British diplomatist

to China to demand reparation for the seizure of the British *Iorcha Arrow*, and on the way out diverted his troops to assist Lord Canning in the Indian Mutiny. He negotiated the treatise of Tientsin and Yeddo in 1858, and in China again in 1860 secured the ratification of the treaty of Tientsin. In 1861 he was appointed viceroy of India, where he died, at Dharmasala, Nov. 20, 1863. *Consult* his *Letters and Journals*, 1872; Lives, J. G. Bourinot, 1905; G. M. Wrong, 1905; W. P. M. Kennedy, 1926; J. L. Morison, 1928.

**Elgin**, VICTOR ALEXANDER BRUCE, 9TH EARL OF (1849–1917). British statesman. Born at Montreal, May 16, 1849, when his father was governor-general of Canada, he was educated at Glenalmond, Eton, and Balliol College, Oxford. In 1863 he succeeded to his father's estates and titles, these including the earldom of Kincardine. With Gladstone he became a Home Ruler, and in the government of 1886 was treasurer of the household and first commissioner of works. During the years 1894–99 he was viceroy of India. In 1902 he was chairman of the royal commission appointed to inquire into the preparations for the South African War, and later of the one that reported on the ecclesiastical crisis in Scotland, caused by the judgement of the house of lords on the property of the Free Church. In 1905 Campbell-Bannerman made Elgin colonial secretary, but he did not retain this office when Asquith became premier in 1908, refusing then the marquessate offered him; his cautious policy and freedom from partisanship had not been altogether acceptable to his party. He died at Broomhall, Fife, Jan. 18, 1917.

**Elgin Marbles**. Collection of sculptures brought from Greece by the 7th earl of Elgin, while ambassador to the Porte. Keenly interested in the remains of ancient art in Athens and other Greek towns, his first intention was to have accurate drawings of them made, but seeing that they were fast going to ruin, he obtained the Porte's sanction to remove various relics. These consisted largely of sculp-

tures by Pheidias and other great artists from the Parthenon and the temple of Nikē Apteros (Wingless Victory) in Athens. Despite enormous difficulties, including the wreck of the ship conveying the precious cargo to England, the Elgin Marbles (as they were afterwards collectively called) were brought to London in 1806. Added to in later years up to 1812, they were finally acquired for the British nation in 1816 for £35,000, less than half of the sum (£74,000) Lord Elgin had paid to preserve them from total destruction, and are now in the galleries of the British Museum. Lord Elgin was accused by Byron and others of



Elgin Marbles. Two views of the north frieze of the Parthenon, now in the British Museum

vandalism, and even dishonesty, but the select committee of the house of commons appointed to investigate the whole subject entirely exonerated him. During the Second Great War the exhibits were stored in Aldwych station, London. *See* art illus. p. 661.

**Elgon**. Extinct volcano, 14,140 ft. high. It stands on the frontiers of Uganda and Kenya Colony, 60 m. N.E. of the Victoria Nyanza. The rivers on the W. side drain into Lake Kioga, those on the E. into the Victoria Nyanza. The forest (about 50 sq. m.) on Mount Elgon is little known.

**El Greco**. Name by which the painter Domenico Theotocopuli (*q.v.*) is best known.

**Eli**. Judge and priest of Israel in the later period of the Judges. Through Samuel, who was in his service as a boy attendant, God indicated his anger at the misdeeds

of Eli's sons. When the news came that the Ark of the Covenant had been taken by the Philistines, and both his sons killed, Eli fell back and broke his neck.

**Elia**. Name taken by Charles Lamb. It was that of a clerk in the South Sea House, and was first assumed by Lamb when in 1820 he began to contribute essays to *The London Magazine*. *See* *Essays of Elia*; Lamb, Charles.

**Elibank**, VISCOUNT. Scottish title. A barony of the same name has been held since 1643 by the family of Murray. Patrick Murray, a person of importance in Selkirkshire, where Elibank is situated, and on the Scottish borders generally, was made a baronet in 1628, and a baron by Charles I in 1643. His title passed to his son Patrick in 1650, and then down a line of descendants, of whom George, the 6th baron, became an admiral. In 1871 Montolieu Fox Oliphant (1840–1927) became 10th baron, and in 1911 he was made a viscount of the U.K. His eldest son, Alexander, was made Lord Murray of Elibank in 1912, after serving as chief whip of the Liberal government (*see* Murray).

Of Viscount Elibank's younger sons, Gideon (b. 1877) succeeded as 2nd viscount in 1927. He was a distinguished administrator in New Guinea and South Africa, and wrote a volume of reminiscences, *A Man's Life*, 1933.

**Elie**. Police burgh, parish, and holiday resort of Fife, Scotland. It is on the N. side of the Firth of Forth, 10 m. S. of St. Andrews and 45 m. N.E. of Edinburgh by railway. It includes Earlsferry, a royal burgh. It has a harbour and pier, and is a coastguard station with a flashing light on Elieness. There are fine golf links. Pop. of parish, 1,251.

**Elihu**. The last of Job's comforters, as described in the Book of Job, chaps. 32–37. A young man, he reproved alike Job for being righteous in his own eyes, and the three older comforters for condemning Job without answering him. The burden of Elihu's speech is a justification of the ways of God. His words and character may have been added to the book by a later writer.

**Elijah**. Hebrew prophet. A native of Gilead (1 Kings 17), he lived in the days of Ahab. He appears to have led a kind of hermit life in the mountains, emerging only at intervals to denounce Ahab and attack the priests of Baal. On Mount Carmel he challenged

the priests of Baal to a test of the rival religions by calling down fire from heaven, after which he had to flee from the wrath of Queen Jezebel to Beersheba, where he seems to have wandered about the desert for six weeks.

When Ahaziah succeeded Ahab, Elijah warned him that he would die as a result of an accident that he had suffered. Towards the close of Jehosaphat's reign Elijah was still living, for he sent a letter to Jehoram, the king's son. When the end came, we are told that Elijah passed in a chariot of fire into the heavens. Jewish tradition long held that he would reappear before the coming of the Messiah, and the chair of Elijah is still set ready at the Passover meal.

Legend points out Elijah as the founder of the Carmelite Order, and in the Greek Church he is regarded as the patron saint of the mountains. He appears to have had some connexion with the mysterious religious communities known as the "Sons of the Prophets," of which there were a large number in Palestine in his period. In the N.T. he is referred to as Elias. His mantle and power fell to Elisha.

**Elijah.** Oratorio by Mendelssohn, set to texts from the O.T. First performed at Birmingham, Aug. 26, 1846, it was an immediate success and soon took its place after Handel's Messiah in popular favour in England. After revision it received its first German performance at Hamburg, Oct. 7, 1847. A stage version was given by the Moody-Manners Opera at Liverpool in 1912. An unusual feature is that the name part is for bass. Recitative, aria, duet, trio, quartet, and chorus are employed. The work is of great dramatic power, e.g. in the choral appeals to Baal, the declamation for soprano at the beginning of the second part; and such arias as Lord God of Abraham (bass) and O Rest in the Lord (alto) are often sung apart from the oratorio.

**Elim Movement.** A British evangelical sect which bears the title Elim Foursquare Gospel Alliance. It was founded in co. Monaghan, Ireland, by Pastor George Jeffreys, head of the organization until 1939. The name Elim is taken from the last verse of Exodus 15, where it is recorded that the Israelites encamped in the wilderness and refreshed themselves by the wells of water in the shade of a grove of palm trees.

Elim preaches the literal truth of the Scriptures, the efficacy of

divine healing through the laying-on of hands, and the imminence of Christ's second coming. It emphasises the close personal relationship between Christ and the sinner.

The Alliance is governed by a conference, which meets annually, consisting of representatives (ministers and laymen) from the churches. There are churches in London and the provinces, and the organization maintains home and overseas missions. Every Easter Monday it holds a festival in the Albert Hall, London, where new converts are baptized by total immersion. The headquarters are at 20, Clarence Avenue, Clapham Park, London, S.W.4.

**Eliot, CHARLES WILLIAM** (1834-1926). American educationist. Born at Boston, March 20, 1834, he was educated there and at Harvard. In 1854 he became a mathematical tutor at Harvard, and later assistant professor of mathematics and chemistry in the Lawrence scientific school. After studying in Europe he was appointed in 1865 professor of chemistry in the Massachusetts Institute of Technology. In 1869

he was chosen president of Harvard, being made emeritus on his retirement in 1909.



Charles W. Eliot,  
American  
educationist

At Harvard Eliot did great work. He reconstructed the law and medical schools and introduced the elective system into the curriculum. The example of these achievements helped to raise the standard of academic education throughout the U.S.A. He was not only a great university administrator, but long exercised an unrivalled authority as an adviser on national questions. He twice declined the ambassadorship to Great Britain. His annual reports as president of Harvard were notable publications, and he also wrote Educational Reform, 1893; Four American Leaders, 1906; The Road Towards Peace, 1915. He died Aug. 23, 1926.

**Eliot, GEORGE** (1819-80). Pen-name of Mary Ann, or Marian, Evans, English novelist. She was

born at Arbury Farm, near Nuneaton, Nov. 22, 1819. The daughter of an estate agent, living for us in



George Eliot,  
English novelist

After F. D'Albert Durade

Adam Bede and in Caleb Garth (of Middlemarch), she early became wise in all that pertains to country life in Warwickshire, of which she has given us so intimate a picture. Her mother's death, and the marriage of her elder sister, Christiana (also drawn in Middlemarch), threw on her shoulders at 16 the responsibility of her father's household.

Here she was surrounded by the influences of evangelical revivalism, deeply confirmed by her aunt Elizabeth, the original of Dinah Morris (in Adam Bede).

A move to Coventry in 1841 brought her into a more literary atmosphere. A student of German and Italian, Latin and Greek, and music, she now mingled with those for whom books were their most treasured companions and philosophy the chief staple of daily talk. Though too sensible and affectionate to risk permanently estranging her father by any formal and visible break with the religious observances of her childhood, she turned her mind to such tasks as a translation of Strauss's Life of Jesus, and in her heart gave up orthodox faith for ever.

#### Entry into Journalism

When in 1849 the old man died, it was natural that she should seek further freedom of intellect in London among the men and women then chiefly inspired by the materialistic agnosticism of Herbert Spencer. She was soon assistant-editor of the Westminster Review, where she published weighty articles on ethics, through which she met George Henry Lewes. The union between them, life-long though not tied by legal marriage, was not lightly entered upon. George Eliot's preoccupation with the problems of married life, her continual insistence upon the binding nature of promises between husband and wife, are pathetic testimony to her uneasiness in a position that could so easily be criticised from her own standard of duty. But as she had entered into it with deliberation, she never admitted disloyalty to her own conscience; and from a literary point of view, the consequences were an unmixed gain.

It was Lewes who first discovered her genius for fiction.

Instantly recognizing a new force in literature, he encouraged her diffident aspirations, and himself carried out all the negotiations with editors and publishers, which resulted in the anonymous appearance of three stories in Blackwood's Magazine, published in 1858 as the well-known Scenes of Clerical Life. Immediately popular, they were followed by Adam Bede, 1859; The Mill on the Floss, 1860; and Silas Marner, 1861. Henceforth she lived happily and strenuously among the thinkers of the day, a professional woman of letters, whose work enjoyed much critical appreciation, popularity, and influence among thoughtful

lesser degree her later novels, reveal the dangers of undigested analysis in imaginative writing; she was weighted with anxiety about the soul of mankind. But because she was before all things a great artist and a warm-hearted and sympathetic woman, she was able to create an immortal gallery of human beings, whose joys and sorrows can never lose their hold on the affections. Her excellent professional training secured fine fruit for her varied powers of ordered memory, acute observation, and dramatic instinct. The earlier novels reach right into the heart of things because they are built on the most intimate experiences

of youth, with spontaneous humour and deep emotion. If the style, the plot, and the psychology of what followed yield somewhat to affected pedantry, we have, at least in Middlemarch, many a revelation in emotional problems.

Like her great feminine predecessors she was realistic and paradoxical; but what Charlotte Brontë first bitterly proclaimed on a few passionate topics became with George Eliot a definite philosophy universally applied. She insisted that women should dare to think for themselves, establish their own moral standards, follow their own conscience, and even demand man's acquiescence. No writer of fiction has illustrated with greater power the ultimate ethical truths of life, the tragic pathos of continual backsliding, and the eternal significance of the choice between good and evil. Her passionate faith, indeed, called for more than reason could give to doubt. Her message was not final. But she left an unrivalled revelation of much that our forefathers were feeling, thinking, and striving for: a living picture of Victorian domesticity, the farmer, the tradesman, and their womenfolk.

#### R. Brimley Johnson

*Bibliography.* Life, as related in Letters and Journals, ed. J. W. Cross, 3 vols., 1885; Monographs, M. Blind, new ed. 1888; O. Browning, 1890; L. Stephen, 1902; J. L. May, 1930; E. and G. Romieu, Eng. trans. B. W. Downs, 1932; Selected Letters, ed. R. B. Johnson. 1926.



George Eliot. Arbury Farm, Nuneaton, where George Eliot (Mary Ann Evans) was born, Nov. 22, 1819

middle-class readers. Her later output embraced *Romola*, 1863, a painstaking reconstruction of the past; *Felix Holt*, the Radical, 1866, a political treatise; *Middlemarch*, 1871-72, a problem novel with three loosely-knit plots; *Daniel Deronda*, 1876, a study of an alien race; besides *The Spanish Gypsy* and *The Legend of Jubal* in verse, and the somewhat ponderous collection of short essays entitled *Impressions of Theophrastus Such*. After Lewes's death in 1878, she married in 1880 John W. Cross, afterwards her biographer, but died Dec. 22 that year.

#### George Eliot's Sense of Duty

It was the grafting of a somewhat arid philosophy upon the Calvinism of early years that gave distinction and popularity to George Eliot's work. Always profoundly religious, and mastered at all times by an uncomfortably strict sense of duty, she met the questionings of the mid-Victorians with a rare and illuminating sincerity, and awoke echoes in many a young, ardent spirit newly alive to the serious mysteries of life.

She was, in fact, more receptive than original or independent; her poems, and Theophrastus, and in

**Eliot, Sir JOHN** (1592-1632). English politician. Born at Port Eliot, Cornwall, and educated at Exeter College, Oxford, he was knighted in 1618, and in 1619 was appointed vice-admiral of Devon as a supporter of the duke of Buckingham. First elected M.P. in 1614, he made an attack on Buckingham in 1626 and was sent to the Tower. On release he was a principal promoter of the Petition of Right, 1628. On March 2, 1629, Eliot drafted and Holles read a protest against unauthorised taxation, whilst the Speaker was forcibly held down in his chair. Two days later Eliot was sent to the Tower. He remained there until his death, Nov. 27, 1632. He is regarded as a martyr for parliamentary freedom. *Consult* Life, J. Forster, 1864.



Sir John Eliot, English politician  
From a painting in the possession of the Earl of St. Germans

**Eliot, JOHN** (1604-90). English missionary to American Indians. He was born at Widford, Herts, and educated at Jesus College, Cambridge. In 1631 he went to America and in 1646 became a Protestant missionary to the Indians in Massachusetts. His headquarters were at Natick; and he died at Roxbury, May 21, 1690. Eliot translated the Bible into the native dialects, in addition to preparing a grammar and catechism. He assisted in the preparation of the famous Bay Psalm Book (*q.v.*).

**Eliot, THOMAS STEARNS** (b. 1888). An American-born British poet. He was born Sept. 26, 1888, at St. Louis, Mo., and educated at Harvard, the Sorbonne, and Merton College, Oxford, a cosmopolitan training which is reflected in his poetry. After 1913 he lived mainly in London where, after a short time as a bank clerk, he taught and lectured. His first volume of poems, *Prufrock and Other Observations*, was published in 1917, and contained work dating from 1909. It reflected mainly the New England period of his life and included four acid comments on Boston society written in 1915; the earliest poem he



John Eliot, English missionary

allowed to be printed, *Conversation Galante*, written at 19; and three of his most characteristic poems, *Portrait of a Lady*, *The Love Song of J. Alfred Prufrock*, and *La Figlia che Piange*, written—in that order—between 21 and 23.

Eliot's friendship with Ezra Pound profoundly influenced his technique. Together the two poets read and studied the same sources, interchanged ideas, and made similar experiments in versification; and his next volume, *Poems*, 1920, showed a complete contrast with his earlier work. It contained a series of biting satires, of which *The Hippopotamus* (1917) was the first, and four poems in French. In the same year he published his first volume of criticism, *The Sacred Wood*. In one of the essays, *Tradition and the Individual Talent* (1917), he explained his theory of poetry; and in others, notably those on the Elizabethans, gave clues to the influences at work on his own writing.

#### The Waste Land

The publication of *The Waste Land* in 1922 marked Eliot's emergence as a major poet. This poem of 433 lines, with its fifty annotated references and other literary and historical allusions, its quotations in five different languages (including Sanskrit), its variety of rhythm, and its elliptical phrasing, is a comment on modern civilization. Its apparent obscurity and unquestionable difficulty ensured that its original impact was on a small literary circle; but it gradually won acceptance and exercised a decisive influence on younger poets for twenty years. In 1922 also Eliot founded and edited *The Criterion*, a literary review, which until its cessation in 1939 maintained an unquestioned supremacy among critical magazines. The new venture was published by the firm of Faber, of which Eliot became a director.

In 1925 he published his first volume of collected poems; in 1927 he became a naturalised British subject and about this period joined the Church of England. In the preface to his second volume of essays, *For Lancelot Andrewes* (1928), he described his general point of view as "classical in literature, royalist in politics, and Anglo-Catholic in religion." His next volume, *Ash Wednesday* (1930), a sequence of religious poems, announced what was thereafter to be the main preoccupation of his thought and work—a mysticism which found its culmination in *Four Quartets* (1944) comprising

*Burnt Norton*, *East Coker*, *The Dry Salvages*, and *Little Gidding*, which had been separately issued between 1936 and 1942.

Throughout the 1930s the religious issue dominated Eliot's work, whether in a topical pamphlet like *Thoughts after Lambeth* (1931); in a pageant play, *The Rock*, written for performance at Sadler's Wells Theatre in 1934 on behalf of the Forty-Five Churches Fund of the Diocese of London; in a play on Becket, *Murder in the*



T. S. Eliot, British poet

*Cathedral*, which was performed in Canterbury Cathedral in 1935 and subsequently had an outstanding success in London, or in a series of lectures, *The Idea of a Christian Society*, delivered in 1939 at the invitation of the master and fellows of Corpus Christi College, Cambridge. Eliot's dramatic work was heralded by the publication in 1932 of *Sweeney Agonistes*, described as "fragments of an Aristophanic melodrama"; *Murder in the Cathedral* was followed by *The Family Reunion*, 1939; *The Cocktail Party*, 1949.

During the 1930s academic recognition came to him. In 1932 he returned to the U.S.A. as Charles Eliot Norton professor of poetry for 1932-33 in his old university of Harvard, delivering the lectures which were subsequently published as *The Use of Poetry and the Use of Criticism*. Awarded hon. Litt.D. by several universities, including Oxford and Cambridge, he received in 1948 the O.M. and the Nobel prize for literature.

Eliot remains a unique phenomenon in English letters, with imitators rather than successors. It is difficult to analyse the nature of the poetry which, a quarter of a century after the publication of

*The Waste Land*, many readers still find obscure; but it may be epitomised by saying that, in endeavouring to communicate his vision to his readers, he relies not on a subjective expression of his own emotions but on finding an objective standard of reference—which he calls "the objective correlative"—which will evoke the same response from both writer and readers. This objective correlative may be an historical incident, a person, a phrase from another writer, a classical allusion, a reference to an anthropological treatise, the chorus of a popular song, a piece of popular devotion. Many of his poems have thus a superficial appearance of plagiarism or parody; and nearly all contain recondite literary allusions which present problems to those less erudite than himself.

#### Hugh Ross Williamson

**Elis.** Country on the W. coast of Peloponnesus, Greece. Its chief city was Elis, on the Peneus, while another city, Pylos, was the seat of the kingdom of the Homeric hero Nestor. In Elis was the district of Pisa, where the great Olympic games were held every four years. It forms the modern dept. of Elis, the capital of which is Pyrgos. Pop. 148,554.

**Elisabeth.** Mother of John the Baptist, whom she bore in old age (Luke 1). She was the wife of Zacharias, a priest in the Temple, and cousin of the Virgin Mary.

**Elisabethville.** Town in the extreme S. of the Belgian Congo and headquarters of the prov. of Elisabethville. It is 2,305 m. N.N.E. of Cape Town and 292 m. S.E. of Bukama, on the Lualaba portion of the Congo river. The *Étoile du Congo* mine is 8 m. distant, and there are other rich copper deposits in the neighbourhood. European pop. 3,432.

**Elisha.** Son of Shaphat, and companion of the prophet Elijah, whose successor he became (2 Kings 2). At the translation of Elijah he received his mantle as a sign of office. He flourished in the reigns of Jehoram, Jehu, Jehoahaz and Joash, and had considerable influence in public affairs.

**Elixir** (Arab. *el iksir*, the philosopher's stone). In pharmacy, a preparation containing alcohol, flavouring agents, sometimes active ingredients like senna. It is a tincture of various substances held together by alcohol. In alchemy, the elixir of life (*elixir vitae*) was believed to be a substance which would prolong indefinitely the life of anyone who consumed it.

**Elizabeth.** City of New Jersey, U.S.A., the co. seat of Union co. It is near the mouth of Elizabeth river on Staten Island Sound and Newark Bay, 14 m. by rly. S.W. of New York. It makes rly. equipment, sewing machines, motor cars, hardware, and tools, and has oil refineries, chemical works, and shipyards. In 1664 colonists from Long Island made it the first English settlement in New Jersey. In 1747 the College of New Jersey (forerunner of Princeton) was opened. Elizabeth became a borough in 1740, a town in 1796, and a city in 1855. Pop. 109,912.

**Elizabeth.** Feminine Christian name. It originated in a Hebrew word, Elisheba, meaning God hath sworn, and became very popular throughout the Christian world.

It has various forms, one of which is Isabella, and is common in eastern Europe as well as in the west. Eliza, Elsie, and in Scotland Elspeth are among its abbreviations.

**Elizabeth** (1207-31). Hungarian princess and saint. Daughter of Andreas II of Hungary, she was born at Pressburg (Bratislava) and gave herself to the ascetic life. Married in 1221 to Louis IV of Thuringia, she was driven from the court on his death in 1227. Renouncing the world, she lived at Marburg under the influence of Conrad of Marburg, and subjected herself to the severest penances and self-denial. She died there on Nov. 19, 1231, and was canonised in 1235, after many miracles reported from her tomb. Nov. 19 is her festival. *Consult Lives, W. Canton, 1922; F. J. von Weinrich, 1933.*

## ELIZABETH: HER REIGN AND ITS GLORIES

A. D. Innes, *Author of England Under the Tudors*

*This biography is one of the most important of the series on the sovereigns of England and Scotland. Further information is under England: History; Mary Queen of Scots; Armada. See also biographies of Burghley; Drake; Leicester; Philip II, etc.*

Elizabeth was the daughter of Henry VIII and Anne Boleyn, whom he married before the English law courts had pronounced his earlier marriage with Catherine of Aragon invalid. Elizabeth was born on Sept. 7, 1533; Catherine did not die till 1536. According to Roman Catholics, therefore, Elizabeth was not born in wedlock. In 1536 Anne was executed, after a pronouncement of the courts that her marriage had not been valid. The title under which Elizabeth succeeded her half-sister Mary in 1558 was conveyed by the will of Henry VIII. The actual legitimate heir to the throne was her cousin Mary Queen of Scots, the granddaughter of Henry's elder sister, Margaret.

Elizabeth's girlhood was hard and loveless; she lived in an atmosphere of suspicion, in which she learnt that duplicity was the condition of self-preservation. During Mary's reign she was charged with complicity in Wyatt's rebellion, though it was found impossible to bring the accusation home to her. Throughout the reign she was kept under suspicious surveillance, but successfully evaded definite profession of her sister's religion. It was imposed upon her by her position that she should take her stand as a Protestant. Her own wisdom taught her that her strength must depend upon the solid support of her Protestant subjects.

From her accession in 1558 Elizabeth was herself the ruler of her

country, though she chose and trusted her counsellors with profound insight. Public opinion demanded that she should marry, and secure an undisputed succession. She herself never had the slightest intention of marrying, but understood to the full the diplomatic use that might be made of the fact that it was open for her to choose a husband. For five-and-twenty years



*Elizabeth*

*From an engraving by W. Rogers in the collection of H.M. the King*

she played with marriage proposals, the most notable of her suitors being Philip of Spain, whose offer she declined in the first months of her reign; the Austrian Archduke Charles; Henry of Anjou, afterwards Henry III of France, her junior by eleven years; and finally his younger brother, Francis. Fears were at one time entertained that she might marry her undesirable favourite, Robert Dudley, whom she made earl of Leicester. It was not till she reached the age of fifty that the theory of her probable marriage was finally abandoned.

The antagonism between Elizabeth and Philip of Spain was the controlling factor in her policy. Elizabeth saw that Philip's hands were tied; if he struck at her successfully the succession of Mary Stuart to the English throne would be the inevitable result, and Mary's association with France was so intimate that her accession would almost inevitably mean the close alliance of England and France, to the great inconvenience of Philip. Hence for five-and-twenty years a positive rupture between England and Spain seemed always imminent, but was always postponed, which was precisely what Elizabeth wanted.

### Elizabeth and Mary Stuart

England had been weakened by years of misrule, and Elizabeth did not mean to fight until England was strong enough to make sure of winning. Year after year, though she carried on and encouraged what was, in fact, a covert war against Spain, she abstained always from the last provocation which would have compelled Philip to open war. Primarily because the life of Mary Stuart was an obstacle to Philip, she kept Mary Stuart alive and a prisoner, in spite of the personal danger to herself. But Elizabeth's hand was at last forced; in 1586 she was obliged to give open official support to the United Provinces of the Netherlands and sanctioned the execution of Mary Stuart.

The result was the coming of the Spanish Armada, and its annihilation in 1588. After its destruction maritime war between England and Spain continued through the remaining ten years of Philip's life and the five years by which Elizabeth outlived him. For the old queen those years were embittered by the tragedy of the young earl of Essex, Robert Devereux, to whom she became devotedly attached, but whose arrogant folly led him into treasonable acts, from the consequences of which the queen could not save him.





Queen Elizabeth

*From the painting by F. Zuccaro*

To the last Elizabeth persisted in her refusal to make any pronouncement as to her successor on the throne. Besides King James of Scotland, the son of Mary Stuart, there were various living descendants of the two sisters of Henry VIII, all of them Protestants, on whose behalf more or less plausible claims might be put forward. There was also a possible claimant in the person of a daughter of Philip of Spain, who claimed descent from John of Gaunt. But for Elizabeth to have nominated an heir at any time would have been an inducement to her own assassination. Only at the point of death, at Richmond, Mar. 24, 1603, was she said to have approved by a sign the name of the Scottish king.

No reign in our annals is more glorious than that of Elizabeth. Its extraordinary political success was due in great part to her own extraordinary political intelligence and to the peculiarities of her character. Between good fortune and her own ingenuity she was invariably provided with some way of escape from every complication which she herself wove, or which was woven about her. In the last resort she deliberately utilised assumed feminine weaknesses as justifying the unjustifiable in her conduct. She made full use of the shrewdest brains, the strongest hands, and the stoutest hearts that could be called into her service; and she never misjudged her servants. But ever she went her own way—devious always, not seldom false, not often generous, but never without knowing exactly what she was doing. And exactly what she was doing was what no other living man or woman, including her most intimate advisers, ever knew. She outwitted every states-

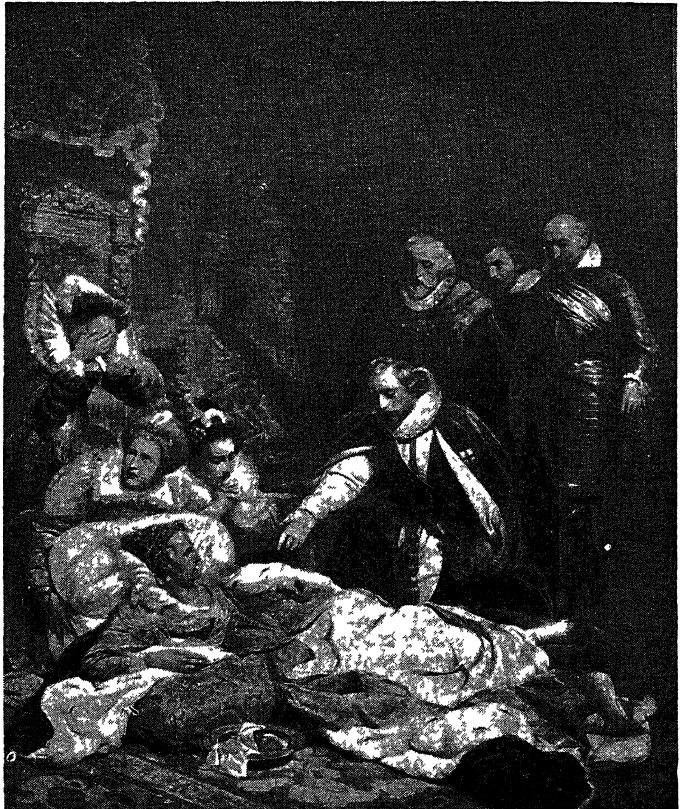
man in Europe; none outwitted her. And she raised England from the degradation into which it had fallen under her immediate predecessors to the highest rank among nations.

But it is not only Elizabeth's political success that gives to the Elizabethan era a unique place in history. It was the era in which England sprang suddenly into the position of maritime supremacy, and an era also of such poetic achievement as could be paralleled only by Athens in the past, and once again by England herself early in the 19th century.

In Elizabeth's reign the English seamen came to their own. They acquired the skill in ocean navigation which gave them a complete ascendancy over the earlier ocean sailors, Spanish and Portuguese. Frobisher and Davis explored the far northern shores of the recently discovered American continent and penetrated deep into the Arctic seas. John Hawkins and many another sea-dog of Devon made the voyage to the Spanish main,

and learnt to make little account of fighting with Spanish ships of thrice their tonnage. Save the Spaniards and Portuguese the Englishman, John Oxenham, was the first European to lay keel in the Pacific. Francis Drake was the first captain who sailed the whole way round the world, since the Portuguese Magellan died before his voyage was completed. Before Elizabeth was dead, Cavendish, too, had sailed round the world. The Englishmen who destroyed the Armada first made it manifest that the ship of war should be herself a weapon of war, with sailors, not soldiers, to fight her; that seamanship is the grand factor in naval warfare, and is the inheritance of Englishmen more than of any other people. The Elizabethan seamen laid the foundations both of the commercial and of the naval supremacy of England, though neither was quite decisively established until nearly another century had passed.

No less astonishing was the literary development of the latter



Queen Elizabeth. The last scene in the royal palace of Sheen, Richmond, where the queen passed away, March 24, 1603, in the presence of some of her advisers

*After a painting by P. Delacroix, in the Louvre, Paris*

half of Elizabeth's reign, extending almost to the close of the reign of her successor. Before this time it would be hard to name any English writers with a real title to the epithet great, except Chaucer and perhaps Thomas More. But at last the creative literary spirit was fermenting. The drama was born. After the Armada the great poetic flood burst forth—Spenser's *Faerie Queene*, Marlowe's tragedies, and then Shakespeare; and, following upon Shakespeare, Ben Jonson and others. The foundations were laid also of an English prose literature by the Essays of Francis Bacon, Hooker's *Ecclesiastical Polity*, the vigorous narrative of Raleigh, and also by the eccentricities of Lyly and his imitators, and the efforts of Sir Philip Sidney, in the search for a prose style.

Both the maritime and the literary energy were the expression of what was the fundamental characteristic of the Elizabethan period, its intense vitality, with free play for its activities. The "spacious days" are rightly named. Intellectually, as well as geographically, the horizon had been infinitely enlarged, the cramping conditions of the Middle Ages had been broken down; the new oceans and new lands were only the material type of the new intellectual and spiritual field which lay open to exploration and cultivation.

**Bibliography.** Lives, M. Creighton, new ed. 1899; M. Wilson, 1932; M. Waldman, 1933; J. E. Neale, 1934; Life and Times, T. Wright, 1838; Letters, ed. G. B. Harrison, 1935; Courtships, M. A. S. Hume, rev. ed. 1940; E. and Essex, Lytton Strachey, 1928. Fanfare for E., E. Sitwell, 1946.

**Elizabeth** (c. 1437–92). Queen of Edward IV of England. She was the daughter of Sir Richard Woodville, afterwards Earl Rivers, and was married first to Sir John Grey, who died in 1461. The young king met the handsome widow while hunting, and married her secretly in 1464, and in 1465 she was acknowledged queen and crowned. Of her children by the king her eldest son became king as Edward V, and her eldest daughter, Elizabeth, became the queen of Henry VII. She refounded Queens' College Cambridge, originally founded by Henry VI's consort, Margaret of Anjou. She was buried in S. George's chapel, Windsor.

**Elizabeth** (1465–1563). Queen of Henry VII. The daughter of Edward IV and Elizabeth Woodville, she was born at Westminster, Feb. 11, 1465. Negotiations for a husband were carried on by her

father, marriages with a Nevill and the dauphin of France being arranged. She was, however, unmarried when Edward died in 1483, and after the murder of her two young brothers in the Tower, she was his heiress. She was then in the power of Richard III, who contemplated marrying her. Before this time, the names of Elizabeth and Henry Tudor had been coupled, and the princess, then in Yorkshire, was probably in the



Elizabeth, Queen of George VI. Her Majesty at the state opening of the Union Parliament, Cape Town, in Feb., 1947. Inset, the Queen at the age of five. from a miniature by Mabel Hankey

plot that culminated in the battle of Bosworth. She and Henry were married, after parliament had approved of the match, Jan. 18, 1486, the rival houses of York and Lancaster being thus united. She was crowned queen Nov. 25, 1487.

Elizabeth had seven children: Arthur; Henry, afterwards Henry VIII; Margaret, who became the wife of James IV of Scotland; and Mary, afterwards the wife of Louis XII of France; and three who died in infancy. She died Feb. 11, 1503.

**Elizabeth** (b. 1900). Queen of George VI of Great Britain. She was born Aug. 4, 1900, at S. Paul's Walden Bury, Herts, third daughter of the 14th earl of Strathmore and Kinghorne. On her mother's side she was descended from Elizabeth, consort of Henry VII, on her



father's from Sir John Lyon of Forfeviot, who in 1372 married the daughter of Robert II of Scotland. Lady Eliza-

beth Angela Marguerite Bowes-Lyon spent most of her childhood either at S. Paul's Walden Bury or at Glamis Castle, Angus, Scotland.

On Feb. 12, 1923, her engagement to the duke of York was announced, and the marriage was celebrated at Westminster Abbey on April 26. The duke and duchess took up residence for a time at White Lodge, Richmond Park. Their elder daughter, later heiress presumptive to the throne, Princess Elizabeth, was born, April 21, 1926, while they were residing at 12, Bruton Street, London, and shortly before they went to Australia to open the new parliament house at Canberra. In 1927 they went to live at 145, Piccadilly, London, where they remained ten years. On Aug. 21, 1930, Princess Margaret was born at Glamis Castle, the first member of the British

royal family to be born in Scotland since a younger brother of Charles I.

On Dec. 11, 1936, the duke of York succeeded his brother, Edward VIII, as king, and on May 12, 1937, Queen Elizabeth was crowned with him in Westminster Abbey. She launched the liner which bears her name on Sept. 27, 1938. Long before the outbreak of the Second Great War she was actively engaged in furthering the cause of Great Britain, and the support of the North American continent owed much to the visit paid by the royal couple to Canada, New-

foundland, and the U.S.A. in May-June, 1939. There, as during their state visit to Paris in 1938, Her Majesty's charm of manner, ready sympathy, simplicity, and true understanding endeared her to men and women in every walk of life. These qualities were in still greater evidence during the war. In Sept., 1940, bombs fell on four occasions on Buckingham Palace, and with King George she replied to a cabinet message: "Like so many other people we have now had a personal experience of German barbarity which only strengthens the resolution of us all to fight through to final victory." She broadcast several messages full of appreciative sympathy to the women of the Empire, France, and the U.S.A.; and as commandant-in-chief of the Women's Navy, Army, and Air Force services she often inspected units belonging to these services. She was among those appointed to act as a counsellor of state in the event of the king's illness or absence abroad. In Feb.-April, 1947, the royal couple paid a state visit to S. Africa, where the queen's qualities evoked the same friendly response as they had received in N. America eight years earlier. A study by Lady Cynthia Asquith appeared in 1937.

**Elizabeth** (1837-98). Empress of Austria. Born Dec. 24, 1837, the daughter of Maximilian I, king of Bavaria, she married Francis Joseph of Austria, April 24, 1854. Her attempts to modify the strict etiquette of the imperial court aroused opposition amongst the nobility, but she soon gained the love of the people and retained it to the last. In 1877 she was crowned queen of Hungary. In 1889 her only son, Rudolph, died in very tragic circumstances; her cousin, Leopold of Bavaria, committed suicide, and her sister, Sophie, duchess of Alençon, was killed in a fire at a Paris charity bazaar, 1897. The empress herself was mortally stabbed by an Italian anarchist at Geneva, Sept. 10, 1898. There are Lives by K. Tschuppik, Eng. trans. E. Sutton, 1930; and Count Corti, Eng. trans. C. A. Philips, 1936.

**Elizabeth** (b. 1876). Queen of the Belgians. She was born July 25, 1876, at Possenhofen, of a younger branch of the Bavarian royal family. On Oct. 2, 1900, she was married at Munich to Albert (1875-1934, *q.v.*), who in 1909 became king of the Belgians. During the First Great War she worked constantly for the good of her

people, often visiting the front line with her husband. After his death in a mountaineering accident she withdrew from public life, and was at Laeken during the German occupation of 1940-44. Leopold III was her son, as was Prince Charles, who was sworn in as regent of Belgium in her presence on Sept. 21, 1944.

**Elizabeth** (1596-1662). Queen of Bohemia. The eldest daughter of James I of England, she was born at Falkland, Fife, Aug. 19 1596. In 1612 she was betrothed to the elector palatine Frederick V, whom she married early in 1613, beginning wedded life at Heidelberg. In 1618 Frederick was chosen king of Bohemia, and the Thirty Years' War began. He and his wife were crowned at Prague in 1619 and lived there for a time, but soon were fugitives, the queen ultimately reaching Holland, where Maurice of Orange befriended her. By this time Frederick had lost the palatinate as well as Bohemia, and the exiled pair remained in Holland, where in 1632 the elector died.

Elizabeth strove to obtain the lost palatinate for her eldest surviving son, Charles Louis, and in 1648 had the satisfaction of seeing him settled at Heidelberg. He did nothing, however, to relieve the poverty to which she was reduced by her husband's misfortunes and



Elizabeth, Queen of the Belgians

the loss of her own annuity as an English princess after the Civil War broke out. She remained in Holland, befriended by the earl of Craven, to whom report, probably incorrectly, said she was married. In 1661 she crossed over to England and was given a pension by Charles II. She was living in Leicester Square, London, when she died, Feb. 13, 1662. Elizabeth had thirteen children; two, Rupert and Maurice, fought in the Civil War for their uncle, Charles I, and the twelfth was Sophia, the mother of George I. She was beloved by the English, and a famous poem was addressed to her by Sir Henry Wotton. *Consult* Life, Carola Oman, 1938.

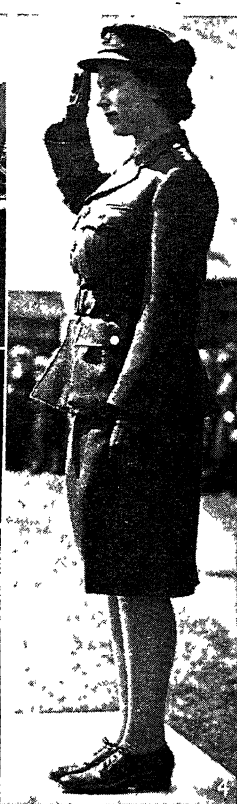
**Elizabeth** (1843-1916). Queen of Rumania. Born at Neuwed, Dec. 29, 1843, she was the daughter of Prince Hermann of Wied. In 1869 she married Prince (later king) Carol of Rumania. She endeared herself to her adopted country by ministrations to the wounded in the war with Turkey (1877-78), and founded the order of Elizabeth to reward distinguished Red Cross work. She became a widow Oct. 10, 1914, and died March 2, 1916.

A fine musician, and no mean painter, the queen wrote under the pen-name of Carmen Sylva and published poems and stories in Rumanian, German, French, and English. Her chief works are *Stürme*, 1881; *Leidens Erdengang*, 1882 (Eng. trans. by M. A. Nash as *Suffering's Journey on the Earth*, 1905); *Les Pensées d'une Reine*, 1882; *Pelesch Märchen*, 1883, a book steeped in Rumanian folk-lore. *Consult* Carmen Sylva, Queen and Woman, E. Burgoyne, 1941.

**Elizabeth** (1709-62). Empress of Russia. Daughter of Peter the Great, and therefore called Elizabeth Petrovna, she was born near Moscow, Dec. 18, 1709. She is said to have married a common soldier when quite young. During her cousin Anne's reign, 1730-40, she took no part in court affairs, but gave rein to her somewhat abandoned tastes. On Dec. 6, 1741, aided by her intimates and partisans, she dethroned the child emperor, Ivan VI, by a *coup d'état* at the Winter Palace, and mounted his



Elizabeth, Queen of Frederick V of Bohemia, painted by Derick Hampton Court Palace



throne. Throughout the Seven Years' War she worked steadfastly for Russian interests, implacably in her opposition to Frederick II of Prussia. Joining with France and Austria against Prussia in 1757, she was a tower of strength in that combination which brought Prussia almost to destruction by the end of 1761, her army having entered Berlin in 1760. To Frederick's great relief, Elizabeth died Jan. 5, 1762, whereupon the alliance against him collapsed. Before her accession an indolent woman, as empress she ruled with unselfish energy, strengthening Russian prestige all over Europe, and carried out various internal reforms. She founded the university of Moscow, 1755, and the academy of arts at St. Petersburg (Leningrad).

**Elizabeth** (1635-50). English princess. The second daughter of Charles I, she was born Dec. 28,



Elizabeth,  
English princess  
From an old print

1635. She was placed in the charge of parliament, and appealed in a touching letter to the house of lords for permission to retain her attendants. In 1648 she helped her brother James, duke of York, to escape. She said goodbye to her father the day before his execution, and, after a visit to Penshurst, was sent to Carisbrooke Castle, where she died, Sept. 8, 1650, from fever. She was buried in St. Thomas's church, Newport, where is a monument to her by Baron Carlo Marochetti erected by Queen Victoria in 1856.

**Elizabeth** (b. 1926). Heiress presumptive to the throne of Great Britain. The elder daughter of George VI was born at 12, Bruton Street, London, on

April 21, 1926, and baptized Elizabeth Alexandra Mary five weeks later at Buckingham Palace. The director of the princess's education was her mother, and in addition to the usual subjects she studied economic and constitutional history, and the trend of political developments. She acquired a real feeling for history and a marked sense of the richness of the tradition into which she was born. She became a good horsewoman and a fine swimmer. An excellent pianist, the first honorary distinction she accepted from a civilian body was the presidency of the Royal College of Music. Her other favourite among the arts was the drama.

In 1937, with her sister Princess Margaret, she joined the 1st Buckingham Palace company of girl guides and became a patrol leader. She became a sea ranger in 1942, later holding petty officer's rank in the sea rangers' ship Duke of York. In Dec., 1946, she was appointed Chief Ranger of the British Empire. On the princess's 16th birthday her father appointed her honorary colonel of the Grenadier Guards. She was granted a commission in the A.T.S. on March 5, 1945.

On her 21st birthday while on a tour of S. Africa with her parents, the Princess broadcast to the British Commonwealth a dedication of her life to the service of that Commonwealth. Her betrothal to her second cousin, Lieut.



Elizabeth, heiress presumptive to the British throne.  
1. In her first year. 2. The princess in her sitting-room at Buckingham Palace. 3. Fulfilling a public engagement in 1947. 4. As an officer in the A.T.S. in 1945  
Photos: 1, F. & H. Thurston; 2, Studio Lisa

Philip Mountbatten, formerly Prince Philip of Greece and Denmark, was announced July 10, 1947, and they were married at Westminster Abbey, Nov. 20. The bridegroom having been created duke of Edinburgh one day earlier, the princess's official style became H.R.H. Princess Elizabeth, duchess of Edinburgh. A son, Charles Philip Arthur George, was born Nov. 14, 1948.

**Elizabeth, PHILIPPINE MARIE HÉLÈNE** (1764-94). French princess, usually known as Madame Elizabeth. Born at Versailles, May 3, 1764, she was a granddaughter of Louis XV. Devoted to her brother Louis XVI, she accompanied him on his flight to Varennes, and shared his captivity in the Temple. Accused of aiding Louis in 1792, she was guillotined, May 10, 1794.

**Elizabeth**. Pen-name of a British novelist who married as her second husband the 2nd Earl Russell. See Russell, Mary, Countess.

**Elk** (*Alces machlis*; Gr. *alkē*, Lat. *alcēs*). Largest member of the deer family, known in America as the moose. The European elk is found in Scandinavia, E. Prussia, Poland, and parts of Russia; but is now much diminished in numbers, and occurs only locally. The adult elk is usually about 6½ ft. high at the withers, and may weigh 1,000 lb. It is very long



**Elk.** Specimen of the common elk, or moose, *Alces machlis*

in the leg, of heavy build, short in the neck, with long ears, and has a long head with overhanging muzzle. The antlers of the male are broad and palmated. It inhabits dense forests, where it feeds mainly on the leaves and young branches of the willow and birch as well as on lichens and moss. The flesh is apt to be coarse, and has a musky flavour. See Moose.

**Elk.** Group of mountains of Colorado, U.S.A., in Pitkin co. They form a section of the Rockies near Aspen, and the highest summit is Castle Peak, with an elevation of 14,259 ft.

**El-Kab.** Site of the ancient city Nekheb, near the right Nile bank, 44 m. above Luxor, Upper Egypt. The predynastic capital of the S., it was sacred to the vulture-goddess Nekhbet. Within the girdle-wall, 37 ft. thick and enclosing 75 acres, Quibell conducted excavations in 1897. In the vicinity are many rock-cut tombs with agricultural and domestic scenes. The royal residence lay across the stream at Hieraconpolis.

**Elkan**, BENNO (b. 1877). German sculptor. Born at Dortmund, Dec. 2, 1877, he was educated in Switzerland and studied in Paris and Rome. He was represented in international exhibitions in Germany, France, Italy, and England, where he worked from 1933. His works included tombs, busts, medals, and monuments; his war memorials in Germany were removed by the Nazis. In England he achieved fame by a statue of Raleigh and bronze candelabra with biblical figures for King's

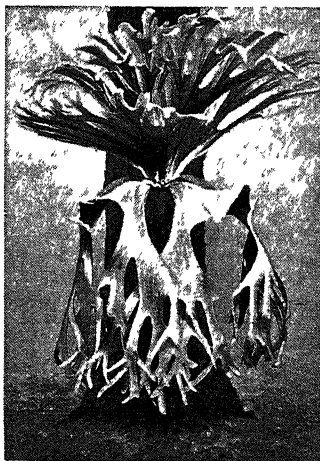
Chapel, Cambridge. Other works include The Four Cardinal Virtues, at Buckfast Abbey, and a plaque at the Rudyard Kipling memorial building, Windsor.

**Elkesaites** OR **ELCHASAITES**. Heretical 3rd century sect which followed alleged revelations contained in the Book of Elchasai. This taught that the Son of God had been manifested in the persons of many good men, and that Christ was merely one manifestation.

**Elkhart.** City of Indiana, U.S.A., lying 100 m. E. of Chicago, in Elkhart co., at the junction of the Elkhart and St. Joseph rivers. It makes 60 p.c. of all band and orchestral instruments played in the world. Other products are motor and aircraft, railway and steamship equipment, pumps, presses, and tools. There are several rlys. and an airport. Settled about 1833, Elkhart received its city charter in 1875. Pop. 33,434.

**Elkington**, GEORGE RICHARDS (1801-65). British manufacturer. Born Oct. 17, 1801, at Birmingham, the son of a spectacle-maker, he became partner and afterwards sole proprietor of his uncle's silver-plating business in that city. By energy and experiment he made electro-plating a commercial proposition, and superseded the old-fashioned method of plating by soldering thin sheets of silver upon copper. He died Sept. 22, 1865.

**Elk's-horn Fern** (*Platycerium*). A small genus of large epiphytall ferns. They are natives of Australia, Malaya, and Africa. The lower fronds, which are barren, are thick and undivided, and spread close to the tree-trunk on which



**Elk's-horn Fern.** Specimen of *Platycerium grande*, growing on a tree trunk

they grow. The much longer fertile fronds present the appearance of a stag's antlers. In an Indian species (*P. bifforme*) they are from 6 ft. to 15 ft. in length.

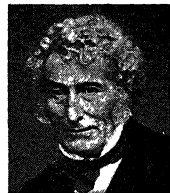
**El** (Lat. *ulna*, Ger. *ellenbogen*, Eng. elbow). Medieval European measure of length. It varies from the English ell, probably borrowed from France, which equals 45 ins., to the Scottish of 37 ins. and the Flemish of 27 ins.

**Ellagic Acid** OR **BEZOARDIC ACID** ( $C_{14}H_6O_8$ ). Constituent of the animal concretions which are met with in Oriental countries under the name of bezoars. It can also be made artificially by treating gallic acid in acetic acid solution with potassium persulphate and sulphuric acid. The name is Fr. *galle* (gall) reversed, with suffix *ic*.

**Elland.** Town and urban district of the West Riding of Yorkshire, England. It stands on the Calder, 3 m. S.E. of Halifax, and has a railway station. The industries include the manufacture of textiles, while there are stone quarries in the neighbourhood. The chief public building is S. Mary's church. Until 1950 Elland gave its name to a parl. div. Pop. 10,327.

**Ellenborough**, EDWARD LAW, BARON (1750-1818). British lawyer. Born at Great Solkeld, Cumberland, Nov. 16, 1750, he was educated at Charterhouse and Peterhouse, Cambridge. He was called to the bar in 1780 and eight years later was leading counsel for Warren Hastings (*q.v.*). In 1802 he was appointed lord chief justice and created a peer. He was the only chief justice to accept a seat in the cabinet. He resigned office in Nov., 1818, and died Dec. 13.

**Ellenborough**, EDWARD LAW, EARL OF (1790-1871). British administrator. Born Sept. 8, 1790, the eldest son of Baron Ellenborough he was educated at Eton and S. John's College, Cambridge, and in 1813 entered parliament.



1st Earl of Ellenborough, British administrator

Made lord privy seal in 1828, he became president of the board of control, and in 1841 governor-general of India. He crushed the Afghans, annexed Sind in 1842 and subdued Gwalior, 1844. Made an earl on his recall, he was first lord of the Admiralty in 1846, and



president of the board of control in 1858. He died Dec. 22, 1871.

**Ellen's Isle** or **EILEAN MOLACH**. Islet in Loch Katrine, Perthshire, Scotland. It is the scene of Scott's *Lady of the Lake*.

**Ellerman Lines.** British steamship company. An offshoot of the Bibby Line, founded in 1840, it was purchased in 1870 by F. Leyland and Co., and flourished as the Leyland line until 1902, when it was sold, the Atlantic service being acquired by the International Mercantile Marine, a U.S. combine, and the Mediterranean services by Sir J. R. Ellerman (1862-1933).

Ellerman Lines Ltd. controls the City, Ellerman, Hall, Bucknall, Papayanni, Westcott, and Laurance lines. The City and Hall lines run passenger and cargo vessels from Liverpool and Glasgow to India and Africa; the Ellerman and Bucknall lines operate services to Africa, Australia, New Zealand, India, and the Persian Gulf, the Far East, and New York; the Westcott and Laurance lines serve the Mediterranean, Black Sea, and the Danube ports from London; while the Ellerman and Papayanni lines have similar services from Liverpool. The Ellerman lines lost 60 vessels during the Second Great War. The headquarters of the combination are 104-107, Leadenhall St., London, E.C.3.

**Elles**, **SIR HUGH JAMIESON** (1880-1945). A British soldier. Born April 27, 1880, in India, he went to Clifton and the R.M.A. He was gazetted to the R.E. in 1899 and served in the South African War. He passed the Staff College course, 1913-14. Crossing with the B.E.F., he served in France throughout the First Great War. He was promoted temporary major-general commanding the Tank Corps in 1918, and was created K.C.M.G. in 1919. Elles was director of military training at the War Office, 1930-33, and master general of ordnance, 1934-38; colonel commandant of the Royal Tank Regiment from 1934, and of the R.E. from 1935. Promoted general in 1938, he retired the same year and was regional commissioner for S.W. England in 1939-40. He died July 11, 1945.

**Ellesmere.** Urban dist. and market town of Shropshire, England. It is 11 m. S.W. of Whitchurch on the rlv. and on the mere and canal of the same name. No traces remain of its castle, whose site is now occupied by a bowling green. S. Mary's church



Ellen's Isle, in Loch Katrine, immortalised in Scott's poem, *The Lady of the Lake*

is a fine Gothic structure. Agriculture is the main industry. There is excellent fishing in the district. Market day, Tues. Pop. 1,872.

**Ellesmere.** An island in the district of Keewatin, N.W. Territories, Canada. It is the largest of the most N. group of Eastern Arctic Islands, and is separated from Greenland by Smith Sound and Kennedy and Robeson Channels. The N. portion is known as Grant Land, and the country to the S.E. as Grinnell Land from its discovery in the second Grinnell expedition, 1854. The interior W. was explored by Greeley and Lockwood (1882-83). The E. coast is steep and rocky, and part of the interior is covered by an extensive ice-cap, but on the W. coast are low rolling areas which supply vegetation for roaming herds of caribou and musk-ox. The highest named peak in Grinnell Land is Mt. Arthur (5,000 ft.) but there are higher ranges beyond. In Lady Franklin Bay, Grant Land, Tertiary coal has been found, the most northerly deposit of fossil fuel known.

**Ellesmere**, **EARL OF**. British title borne since 1846 by the family of Egerton. Frances Leveson-Gower, a younger son of the 1st duke of Sutherland, assumed the name of Egerton in 1833, when he inherited the estates of the Egertons, dukes of Bridgewater. He was a politician with remarkably enlightened views, and won some distinction as a writer and a patron of the arts. He was created Earl of Ellesmere in 1846, and died Feb. 18, 1857. The 5th earl was born in 1915 and succeeded his father in 1944. He has property at Newmarket and at St. Boswells, Roxburghshire. The heir is called Viscount Brackley.

**Ellesmere Port and Whitchy.** Urban dist. of Cheshire, England. It is 7 m. N. of Chester, on the Mersey, and the first port of call on the Manchester ship canal. One of the largest oil ports in the

U.K., it has also iron-works, paper works, flour mills, and dye-works. Pop. 27,750.

**Ellice Islands.** Group of coral islands in the Pacific Ocean. Called the Lagoon islands, they lie N. of Fiji, between lat. 5° 30' and 11° 20' S. and long. 176° and 179° 50' E. The chief industries are connected with phosphates and copra. Formally annexed by

Great Britain in 1915 as the Gilbert and Ellice Islands Colony, they are under the jurisdiction of the high commissioner for the W. Pacific. Area 14 sq. m. Pop. 4,613.

Never attacked by the Japanese, they formed an advanced Allied base during the winter of 1942-43.

**Ellichpur.** Town of India. The chief place in Berar (*q.v.*), it is 100 m. W. of Nagpur. Once an important city and a military cantonment, its prosperity has declined. By local tradition it is supposed to date from the 11th century; it is known to have been prominent in the 13th century, and then passed under Mahomedan rulers. Besides an old palace, the town contains early remains, including a burial shrine associated with a mythical hero, Shah Abdur-Rahman. Cotton is the chief industry. Pop. 21,200.

**Ellington**, **EDWARD KENNEDY** (b. 1899). American negro musician. "Duke" Ellington was born at Washington, April 29, 1899, and first conducted his own band in New York in 1926. Next year, conducting as Duke Ellington at the Cotton Club in Harlem, he achieved an enormous reputation for "hot jazz" and soon took his band throughout the U.S.A. and in 1933 on a European tour. A master of orchestral colour, jazz rhythms, and effective dissonance, he composed songs like *Mood Indigo* and *Solitude* which remained long in the dance music repertory.

**Ellington**, **SIR EDWARD LEONARD** (b. 1877). British air force officer. He was born on Dec. 30, 1877, educated at Clifton and the R.M.A., and commissioned in the Royal Artillery in 1897. He transferred to the R.F.C. 1913, and served in France during the



Sir Edw. Ellington, British air force officer



First Great War. Director general of supply and research at the Air ministry, 1919, he was created a K.C.B. the following year. In 1923 he was A.O.C., R.A.F., in India; in 1929 A.O.C.-in-C., Air Defence of Great Britain. Ellington was appointed chief of the air staff in 1933, and was inspector-general of the R.A.F. 1937-40. He was promoted marshal of the R.A.F. in 1937.

**Elliot, JANE OR JEAN** (1727-1805). Scottish song writer. The daughter of Sir Gilbert Elliot, 2nd bart., of Minto, she is famous as the author of *The Flowers of the Forest*, which Sir Walter Scott included in his *Minstrelsy of the Scottish Border*, 1802. She died in Edinburgh, March 29, 1805.

**Elliot, JOHN** (d. 1808). British sailor. Son of Sir Gilbert Elliot, a Scottish judge, he entered the navy and in 1758 served under Hawke and Anson. He distinguished himself in 1760 off the coast of Ireland in the capture of three French vessels. After serving in the Mediterranean and at Plymouth he commanded the *Trident* to America. In 1779 he sailed under Rodney to the relief of Gibraltar, distinguished himself at St. Vincent, and fought under Kempenfelt. During 1786-89 he was commander-in-chief at Newfoundland, and was promoted admiral, 1795, when he retired. He died Sept. 20, 1808.

**Elliot, WALTER ELLIOT** (b. 1888). Scottish politician. Born Sept. 19, 1888, he was educated at Glasgow



Walter Elliot,  
Scottish politician

academy and university and became a doctor, serving as such in the First Great War. He entered parliament in 1918 as Unionist member for Lanark. From 1924 until defeated by 88 votes in 1945 he represented the Kelvingrove division of Glasgow. After holding several junior offices, he became minister of Agriculture, 1932-36, secretary for Scotland, 1936-38, minister of Health, 1938-40, and director of public relations at the War Office, 1941-42. He came back to the house of commons through a by-election for Scottish Universities in 1946. Elliot was one of the most familiar speakers on the B.B.C. Brains Trust.

**Elliot, CHARLOTTE** (1799-1871). English hymn-writer. She was born at Clapham, March 18, 1799,

and after an uneventful life, passed for the most part as an invalid, she died at Brighton, Sept. 22, 1871. Her hymns, amounting to about 150, placed her among the foremost British women hymn-writers. Many became popular, notably "Just as I am, without one plea."

**Elliott, EBENEZER** (1781-1849). British poet, known as the Corn Law Rhymer. Born at Masborough, Yorks,



Ebenezer Elliott,  
British poet

From a contemporary  
sketch

March 17, 1781, he was engaged, like his father, in the iron trade. He attributed his father's ruin and his own early losses to the bread tax, and in his *Corn Law Rhymes* (1831) he depicted in vigorous language and with intense feeling the sufferings of the poor under the Corn Laws. His hymn beginning "When wilt Thou save the People?" is still sung. He died at Great Houghton, Dec. 1, 1849.

**Elliott, GRACE DALRYMPLE** (c. 1758-1823). Reputed mistress of George IV. She was a daughter of



Grace Dalrymple  
Elliott,  
British adventuress  
After Corway

Hew Dalrymple, an Edinburgh lawyer, was educated in France, in 1771 married John Elliott, and was divorced in 1774. About 1782 she gave birth to a daughter, of whom the prince of Wales acknowledged himself the father. She subsequently settled in France, and died near Sèvres, May 16, 1823. Her account of her life during the French Revolution was published in 1859.

**Elliott, MAXINE** (1873-1940). American actress. Born at Rockland, Maine, Feb. 5, 1873, she

began acting in The Middleman, with E.S. Willard (New York, Nov. 10, 1890), and was soon taking leading parts, including that of Mrs. Allenby in *A Woman of No Importance*. Her

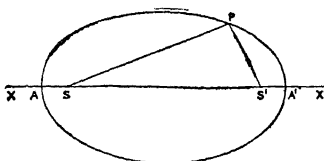


Maxine Elliott,  
American actress  
L. Caswell Smith

Shakespearian renderings were greatly praised. Her first appearance in London was as Silvia in *The Two Gentlemen of Verona*, Daly's, July 2, 1895; thenceforward she acted in England frequently, a notable success being *Zuleika* in Joseph and His Brethren (His Majesty's, 1913). She died March 6, 1940. Her sister, Gertrude, also an actress, married Sir Johnston Forbes Robertson (q.v.).

**Elliott, WALLACE HAROLD**. British clergyman. Elliott was educated at Collyer's school; Brasenose College, Oxford; and Ripon Clergy College. He was curate of Guisborough, 1907-09; vicar of Holy Trinity, Folkestone, 1918-29; a canon and precentor of St. Paul's Cathedral, 1929-30; and vicar of S. Michael's, Chester Square, until 1941. Elliott was then appointed precentor of H.M. Chapels Royal and deputy clerk of the closet. He became chaplain of the order of S. John of Jerusalem, 1944. His weekly religious addresses on the radio were famous in the 1930s. Published works include *Rendezvous*; *The Christian in His Blindness*; *Broadcast Addresses*.

**Ellipse** (Gr. *elleipsis*). A curve such that the sum of the distances of any point on it, from two fixed



Ellipse.  $SS'$ , foci on the axis  $XX'$ .  $AA'$  principal diameter.  $P$  is any point on the ellipse, and has the property that  $SP + S'P$  is constant

points within it, is constant. When the fixed points coincide the curve becomes a circle. See *Conic Sections*.

**Ellipsis**. Figure of speech, whereby part of a sentence, strictly necessary for complete fullness of expression, but which can easily be supplied from the grammatical connexion, is omitted. It is often deliberately employed in writing, in order to lay stress upon what is more important and essential, unessentials being omitted.

**Ellipsoid**. Solid of which all sections are either ellipses or circles. See *Geometry*.

**Ellis, HENRY HAVELOCK** (1859-1939). British author and psychologist. Born at Croydon, Feb. 2, 1859, he studied medicine at St. Thomas's Hospital, London, but before qualifying went to Australia, where he spent 1875-79 as a

teacher. Returning to England, he qualified, but after two years in medical practice he gave himself



Havelock Ellis,  
British author and  
psychologist

almost exclusively to literary and scientific work. From 1889 to 1914 he edited the *Contemporary Science Series*. A student of the pathological and psychological aspects of sex, in 1897 he published the first volume of studies in the *Psychology of Sex*, the seventh and final volume appearing in 1928. Although this was written as a strictly scientific treatise and made no effort to popularise the subject, the first volume gave rise to an outburst of scandalised vituperation and a prosecution followed, with the consequence that later volumes were published in the U.S.A. He died July 8, 1939.

Ellis's psychological work was based upon biological study rather than experimental work; therefore his position has been obscured by the greater popularity enjoyed by Freudian psychology. His writings are distinguished by a deep sympathy and understanding combined with what was when he began to write a new and scientific approach to old problems. In addition to *Studies in the Psychology of Sex*, Ellis wrote on general literary and psychological subjects, e.g. *The New Spirit and the Criminal*, 1890; *Affirmations*, 1897; *The Nineteenth Century*, 1900; *The World of Dreams*, 1911; *The Philosophy of Conflict*, 1919; *Little Essays of Love and Virtue*, 1922; *The Dance of Life*, 1923; *Sonnets from the Spanish*, 1925; *My Confessional*, 1934. His autobiography, *My Life*, appeared posthumously in 1940.

**Ellis, Mary** (b. 1899). American actress and singer. Born in New York, June 15, 1899, she became an art student and subsequently studied singing, making her first appearance on the London stage in 1930 in *Knave and Queen*. The following year she played in O'Neill's *Strange Interlude*. Other successes include *Music in the Air*, 1933; and she was associated with Ivor Novello in his productions, *Glamorous Night*, 1935; *The Dancing Years*, 1939; *Arc de Triomphe*, 1943, and *The Gay Pavilion*, 1945. She also made films in Hollywood.

**Ellis, ROBINSON** (1834-1913). British classical scholar. He was born at Barming, Kent, Sept. 5, 1834, and educated at Rugby and Balliol College, Oxford, where his career was most distinguished. In 1883 he became reader in Latin at the university, and in 1893 professor of Latin. He is chiefly known for his work on Catullus, whose poems he edited and also translated in the original metres; while his *Commentary on Catullus* (1876, 2nd ed. 1889) ranks as the highest authority on its subject. He died at Oxford, Oct. 9, 1913.

**Ellis Island.** Island with an area of 27½ acres in Upper New York Bay, U.S.A. It is a headquarters of the immigration and naturalisation service of the U.S. department of labour. Here immigrants of dubious status remain while the authorities investigate their conformity with immigration regulations. The station was opened in 1892.

**Elliston, ROBERT WILLIAM** (1774-1831). British actor and theatrical manager. Born in London, April 7, 1774, the son of a watchmaker, and educated at St. Paul's School, he made his first appearance at Bath, as Tressell in *Richard III*. On Aug. 29, 1796, he played Sir Edward Mortimer in a revival of George Colman's *The Iron Chest* at The Haymarket. He made his début at Drury Lane, Sept. 20, 1804, succeeding Kemble as Rolla in *Pizarro*, continued a member of the company till 1809, rejoined it for 1812-15, and was lessee of the theatre 1819-26, when he retired bankrupt. He afterwards became lessee of the Surrey Theatre, where he played until within a fortnight of his death on July 8, 1831. Both as tragedian and as comedian Elliston stands high in the annals of the British stage.

**Ellora.** Ruined town of India, in Hyderabad state, 13 m. N.W. of Aurangabad. It is famous for the Kailas temple, 8th cent., and for its rock temples and caves dating from the 5th to the 9th or 10th cent. These caves cover the face of a hill for 1½ m. and belong to three groups—Buddhist, 12 caves, Brahminical, 17, and Jain, 5. See illus. p. 1871.

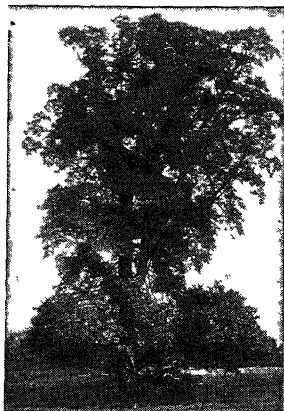
**Ellore.** Town of Madras, India, in the Kistna dist. It stands near Colair Lake, 38 m. N. of Masulipatam. Ellore is noted for its carpets, and has a large trade in grain. Pop. 65,631, nearly all Hindus.

**Ellsworth, LINCOLN** (b. 1880). American explorer. Educated at Columbia and Yale universities, he held a number of engineering appointments in the U.S.A. and Canada until 1924, when he organized a geological expedition to the Andes. In 1925 he was commander and navigator of the Amundsen-Ellsworth polar expedition and in 1926 joint leader of the Amundsen-Ellsworth-Nobile transpolar flight from Spitsbergen to Alaska. He was scientific director of the Wilkins-Ellsworth trans-Arctic submarine expedition of 1931, and in 1935 flew 2,000 miles across the Antarctic, claiming 300,000 sq. m. of territory for the U.S.A. His expeditions earned him awards from many foreign governments and scientific societies. He published *Our Polar Flight* (1925); *First Crossing of the Polar Sea* (1926); *Beyond the Horizon* (1938). See *Antarctic Exploration*; *Arctic Exploration*.

**Ellwood, THOMAS** (1639-1714). English author and Quaker. He was born at Crowell, Oxon, and became a Quaker in 1659, a conversion which cost him several terms of imprisonment. He became companion and reader to Milton after the latter lost his sight, and suggested to him the idea of *Paradise Regained*. He assisted George Fox in the dissemination of his principles. Ellwood's most important work is his autobiography, which was finished by Joseph Wych and published in 1714; new ed. 1900. He died March 1, 1714.

**Elm** (*Ulmus*).

A native tree of Great Britain, of the family Ulmaceae. More frequently found in avenues, parks, and hedges than in woods and forests, elms flourish in any soil, but to attain to their full height of 80 ft. or thereabouts, and to make the best wood, require a rich alluvial loam. The most familiar species are wych elm (*U. montana*) and bell elm (*U. campestris*). Both may be planted



Elm tree in full foliage. It is a comparatively shallow rooting tree  
F. R. Hinkins

in open weather at any time between autumn and spring. The usual way of increasing in private



Elm. Leaves and flowers of common elm

gardens is by layering, or in the case of the bell elm by removal of suckers, as this tree seeds scantily. Elms should not be planted near dwelling-houses, as the timber has a tendency to decay inwardly, involving danger of the limbs dropping off suddenly, without any warning, especially in high winds.

**Elman**, MISCHA (b. 1891). Russian violinist. Born at Talnoï, Russia, Jan. 20, 1891, he received his musical education at Odessa and under Cui at St. Petersburg (Leningrad). He made his début there in 1904, afterwards appearing in Berlin, Dresden, and elsewhere. His first appearance in London took place March 21, 1905; in New York in 1908. From the first he was recognized as one of the world's greatest violinists. He later resided chiefly in the U.S.A.

**Elmet**. Name of a little British kingdom in Yorkshire. It existed in the 6th century and earlier, but was ended when conquered by Edwin, king of Northumbria, about 617. Its extent roughly corresponded to the West Riding. The name was long preserved by the forest of Elmet and exists in Barwick-in-Elmet and Sheburn-in-Elmet, both near Leeds.

**Elmina** OR ST. GEORGE DEL MINA. Small port of the Gold Coast colony, 8 m. W.S.W. of Cape Coast Castle. It was the first lasting European settlement on that coast. Here is a castle, built by the Portuguese in 1482 and succeeding years, taken by the Dutch in 1637, and transferred to the British in 1872.

**Elmira**. City of New York, U.S.A., the co. seat of Chemung co. On the Chemung river, 145 m. S.E. of Buffalo, it is served by several rlys. It contains the state reformatory for male offenders between 16 and 30. Elmira College for women, 1855, was the earliest U.S. college to give women degrees comparable with those for men. A busy rly. and industrial centre, Elmira makes bridges, office equipment, boilers, valves, leather and knitted goods. Settled in 1788, it

was incorporated in 1828 and received a city charter in 1864. Mark Twain wrote much and is buried here. Pop. 45,106.

**El Misti**. Volcanic mt. of Peru in the prov. of Arequipa, by which name the mt. itself is sometimes called. It is a few miles N.E. of Arequipa city. Alt. 19,200 ft.

**Elmore Process**. Method of making seamless copper (or other metal) tubes by depositing the metal by electrolytic action on a bar or mandrel kept rotating in the electric bath. It was devised by J. O. S. Elmore, an engineer in India, in 1896. A tube so formed would be wanting in mechanical strength if the deposition only were depended upon. Elmore therefore compacted the tube as the deposition of metal proceeded by rotating the mandrel against an agate burnisher, and thus greatly increased its strength. The advantage of the process lies in the purity of the product and the elimination of smelting processes.

**Elmshorn**. Town of Slesvig-Holstein, Germany. It stands on the Krüchau, about 10 m. from its junction with the Elbe and 23 m. N.W. of Hamburg. It is a river port. Pop. 15,392.

**Elmsley**, PETER (1773-1825). British scholar. Educated at Westminster School and Christ Church, Oxford, he showed a remarkable aptitude for study. He was ordained, but devoted most of his time to the study of the classics and won a reputation throughout Europe by his critical work on the Greek tragedians. He wrote for the *Edinburgh Review* and the *Quarterly Review*. In 1823 he became principal of St. Alban Hall and Camden professor of ancient history at Oxford. He died March 8, 1825.

**Elmslie**, WILLIAM GRAY (1848-89). British divine. Born at Insch, Aberdeenshire, Oct. 5, 1848, he was educated at Aberdeen university and New College, Edinburgh, and later studied in Germany. In 1873 he became assistant to Dr. J. Oswald Dykes, at Regent's Square Presbyterian church, London, and was chosen minister of Willesden Presbyterian church in 1875. In 1880 he was appointed tutor of Hebrew in the Presbyterian College, London, being elected to the professorship of Hebrew and O.T. literature in 1883. He died Nov. 16, 1889.

His son, William Alexander Leslie (b. 1885), a distinguished Oriental scholar, clergyman, and professor, wrote *Aboda Zara* or *The Mishna on Idolatry*, 1911, and *Studies in Life from Jewish Pro-*

verbs, 1917. He became principal of Westminster College, Cambridge, in 1935.

**Elobey**. Two small islands, called Great and Little, off the mouth of the Gabun river, W. coast of Africa, belonging to Spain. Great Elobey is covered with bush, and has an area of  $\frac{3}{4}$  sq. m. The area of Little Elobey is 22 acres. The islands are under the control of a sub-governor, who is responsible to the governor-general resident at Santa Isabel on the island of Fernando Po. The inhabitants are mostly of the Benga tribe.

**Elocution** (Lat. *eloqui*, to speak out). The art of effective public speaking. In classical times it included oratory, but now refers solely to the method and manner of delivery, the right study of which includes breath control, voice production, articulation, pronunciation, and expression.

Breath is the motive power of the voice. Authorities agree that the intercostal diaphragmatic method of breathing, i.e. the free expansion laterally of the lungs at their base and the descent of the diaphragm in inspiration and the reverse action with an even abdominal pressure in expiration—inhalation quickly and silently and exhaling slowly and evenly—gives a maximum of breath with a minimum of exertion. There should always be a supply of breath in the lungs, and inspiration should be renewed well before expiration is accomplished. A speaker's words should be poised on the breath, for any escape through or between the words will cause loss of tone and power and, under continuous strain of public work, may lead to permanent injury of the voice. An open throat, a mobile jaw, muscular control of the tongue and soft palate, together with right control of the breath, are the keynotes of correct voice production.

A sense of rhythm and beauty of diction, with a distinctive delivery, is as essential in the speaking of modern, as in that of classical, selections. Enunciation is the medium for expressive pronunciation, clearness of articulation being of the greatest importance. The tongue, hard and soft palate, gums, teeth, and lips all constitute part of the articulating organs, and by their partial or complete contact the consonants are formed. Vowels, being purely vocal, are produced by the changing shape of the mouth cavity and varying positions of the tongue. Pace must be varied according to the different emotions expressed. Emphasis is

used principally to mark the salient word or words of a sentence, so as clearly to define the meaning. Its too frequent use negatives its own value, and over-emphasis is an offence to the intelligence. Pauses facilitate proper phrasing, and at the same time permit the reciter to take breath; the rhetorical pause, in which the breath is suspended, is used to emphasise some special effect. Tone should illumine and colour the words so that the full beauty of the theme is expressed.

**Elohism.** Term used in Biblical criticism to denote the writer of one of the documents used in the compilation of the Pentateuch, or rather the Hexateuch. This is called the Elohist document, because the writer uses consistently the name *Elohim* for the God of the Hebrews, whereas the writer of another document (the Jehovistic) employs with equal consistency the divine name *Jehovah*.

**Elongation.** In astronomy, the angle subtended at the earth between a planet and the sun. For Mercury it varies between  $0^\circ$  and  $28^\circ$  (greatest elongation) as the planet revolves in its orbit; for Venus between  $0^\circ$  and  $48^\circ$ . These planets are therefore always seen close to the sun, *i.e.* as morning or evening stars. For the outer planets the elongation can have any value from  $0^\circ$  to  $180^\circ$ , and they are therefore visible from time to time at all hours of the night.

**Elongation.** In metallurgy, the degree of permanent extension in a test piece of standard dimension before fracture takes place under the action of tensile stresses. It is invariably expressed as a percentage of the original gauge length marked off on the test piece. As so defined, elongation is the sum of two separate and measurable elongations, one being a general extension over the whole of the parallel part of the specimen, and the second a local extension taking place at the point of fracture. The first increases with the applied load and varies directly with the gauge length, while the local extension varies with the cross-sectional area and is independent of the gauge length. This implies that as the gauge length becomes shorter the effect of this local extension upon the extension as a whole becomes greater, so that the gauge must bear a certain relation to the cross-sectional area of the test specimen.

**Elopiement.** Name given to the secret flight of a pair of lovers, generally with the object of mar-

riage. Unless abduction can be proved it is not an offence against the law. See Abduction.

**El Paso.** City of Texas, U.S.A., the county seat of El Paso co. The largest city on the Mexican border, a favourite health resort, and a port of entry, it stands 3,760 ft. above sea level on the Rio Grande, which separates the state from Mexico. Situated opposite Ciudad Juarez, it is served by several rlys. El Paso processes copper, lead, and silver ores, refines petroleum, and ships oil, ores, livestock, wool, hides, cotton, and farm produce. It has saw mills, cotton mills, machine shops, and flour mills. The area is to benefit from Elephant Butte dam, on the Rio Grande, 120 m. to the N. El Paso was named from its situation in a rift in the mountains, and was settled in 1827, being incorporated as a town in 1875. English and Spanish are spoken in the city, 60 p.c. of whose inhabitants are of Mexican blood and whose architecture is largely Spanish. Fort Bliss, the largest U.S. cavalry post, is here. Pop. 96,810.

**Elphinstone,** MOUNTSTUART (1779–1859). British administrator. Born Oct. 6, 1779, the fourth son of the 11th Baron Elphinstone, he entered the Bengal civil service in 1796. Appointed resident at Nagpur in 1804, he was sent as envoy to Kabul in 1808, and was resident at Poona in 1811–17, and commissioner after its annexation. During 1819–27 he was governor of Bombay. He returned to England in 1829 and lived in retirement, twice refusing the governor-generalship of India, and died Nov. 20, 1859. Elphinstone compiled the famous legal code known by his name, and virtually founded the system of state education in India. Elphinstone College, Bombay, was endowed by the natives as a memorial to his administration. He wrote a valuable account of the Kingdom of Cabul and its Dependencies, 1815; and a History of India, 1841. His own life was written by J. S. Cotton, 1892.

**Elphinstone,** WILLIAM (1431–1514). Scottish prelate. A native of Glasgow, he attended its university, of which he became rector in 1474. He was made

bishop of Ross in 1481, and nominated to the see of Aberdeen in 1483. In 1488 he was appointed lord chancellor and lord privy seal in 1492. In 1494 he established King's College, the original foundation of Aberdeen university, appointing Boece (*q.v.*) first rector and securing grants from James IV for its maintenance. He introduced the printing press into Scotland, 1507. He died at Edinburgh, Oct. 25, 1514, it is said through grief over the battle of Flodden.

**Elsie Venner.** Novel by Oliver Wendell Holmes. After serial publication in the Atlantic Monthly under the title of The Professor's Story, the novel was published in volume form in 1861 as *Elsie Venner: a Romance of Destiny*. Its theme is the possible effect of antenatal influence upon individual conduct. A mother is bitten by a rattlesnake shortly before giving birth to her child. The romance shows Elsie Venner's whole life and character affected by that pre-natal poisoning, since her nature turns out to be half that of a snake.

**Elsinore** (Dan. *Helsingør*). Seaport in Denmark. In the dist. of Frederiksborg and on the island of Zealand, it stands on The Sound, and has ferry communication with Helsingborg on the Swedish coast, and connexion by rly. with Copenhagen, 25 m. S. Shipbuilding is the principal occupation, and ironfounding, engineering, and agriculture are carried on. The place is the scene of Shakespeare's Hamlet. Pop. 15,841.

**Elster.** Name of two rivers of Germany, the Schwarze (black) and Weisse (white). The former rises in the mountains between Saxony and Bohemia and flows mainly N. until it falls into the Elbe 10 m. above Wittenberg. Its length is 110 m. The white Elster rises near Eger in the Elstergebirge in Bohemia, but most of its course is in Saxony. It falls into the Saale in two branches, one near Halle and the other near Merseburg. It flows past Plauen and Leitz, and past Leipzig, where the Pleisse joins it. Its length is 120 m. The town and watering-place of Elster stands on the white Elster near the Bohemian border. The Elstergebirge is a range of mountains in Bohemia. It runs from the Erzgebirge to the Fichtelgebirge, and reaches a height of 2,630 ft.

**Elstow** (formerly Helenstow). Parish and village of Bedfordshire, England. It is 1 m. S. of Bedford, and is noted as the birthplace of



Mountstuart Elphinstone, British administrator  
From a portrait in the British Museum

John Bunyan (*q.v.*). The church, restored 1880, includes early Norman work.

**Elstree.** Parish and village of Hertfordshire, England. It has a railway station, 7 m. S. of St. Albans. The church of S. Nicolas was rebuilt in the 19th century. Here are paper mills and a large reservoir used for fishing and boating. Film studios are at Boreham Wood near by. Pop. 3,457.

**Elswick.** District of Newcastle-upon-Tyne, England, including a ward in the W. of that county borough, and having a railway station. Here are extensive works of Vickers-Armstrong, Ltd. During both Great Wars vast quantities of munitions of war were manufactured here. Elswick Park was opened as a public recreation ground in 1878.

**El Teb, BATTLE OF.** Fought by the British, Feb. 29, 1884, against the Arabs. El Teb is a post in the Anglo-Egyptian Sudan, on the road from Trinkat on the Red Sea to Tokar. In 1883 Osman Digna was besieging Tokar, and Valentine Baker, with a force of 4,000 men, was sent to relieve it. On Feb. 4, 1884, he was met by the tribesmen and was routed, two-thirds of his men being killed. Tokar then surrendered.

A British force of 4,400 men was then collected from Egypt and India, and under Sir G. Graham was landed at Suakin. On Feb. 29 this force faced the Arabs in their camp at El Teb. The latter threw themselves in wild fury against the British square, but after a fierce combat they were decisively beaten. The British casualties were 34 killed and 155 wounded, largely incurred in a charge made by the 10th and 19th Hussars.

**Eltham.** Parish of Kent, in the London bor. of Woolwich, 8 m. S.E. of London Bridge by Southern rly. Once a marketing town, it contained a palace, the fine banqueting hall of which still remains. Well Hall, an Elizabethan mansion, is supposed to have been occupied by Sir Thomas More's daughter. The Tudor outbuilding was restored in 1935 and is now used as an art gallery and restaurant. Eltham has many open spaces, including Eltham Common,

Avery Hill, and Well Hall Pleasaunce. Pop. 23,308.

Eltham Palace was built towards the end of the 13th century. It owes its origin to Anthony Bec, bishop of Durham, who appears to have lived here c. 1296-1311. At first a fortified manor house, it was subsequently converted into a royal residence. The great hall and part of the old kitchens adjoining are fine examples of domestic architecture of the reign of Edward IV. The 15th century bridge across the moat, which still remains, led by way of a gatehouse to a large court. The architecture of the palace is notable for the fine oriel windows, the open timber roof of the hall, and the gables, with beautifully carved barge boards, of the kitchens. In 1933 Stephen Court-auld was granted a 99 years' crown lease of Eltham Palace on condition that he restored the buildings, demolished the haphazard additions, and built a new house on approved plans. In 1945 he surrendered his lease and on Sept. 26 Lord Nathan, under-secretary for War, opened Eltham Palace as a training college for the Royal Army Educational Corps.

**Eltham.** Township of North Island, New Zealand. It is on the main line from Wellington to New Plymouth, from which it is 36 m. S. The chief centre of the Taranaki district, it has an extensive dairy-industry. Pop. 1,880.

**Elton or YELTON.** Salt lake of Russia, in the region of Stalingrad. It lies on the border of the Kirghiz Steppes, 60 m. E. of the Volga. Area, 60 sq. m. Although it receives the waters of several streams and has no outlet, it is very shallow, and strongly impregnated with salt, thousands of tons being extracted from it yearly. The Kalmucks call it the lake of gold.

**Elton, GODFREY ELTON, 1st BARON (b. 1892).** British political writer. Born March 29, 1892, he

was educated at Rugby and Balliol College, Oxford, and at Queen's College became lecturer in



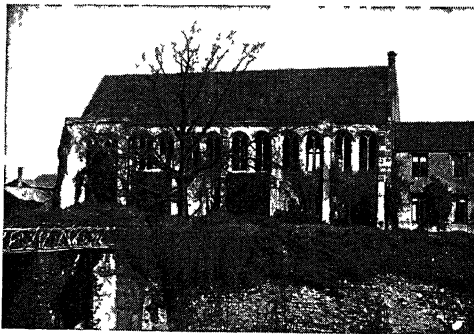
Lord Elton.  
British political  
writer

modern history, 1919-39. An admirer of Ramsay MacDonald (whose Life he wrote, first vol. 1939), he was expelled from the Labour party in 1931 for support of that statesman at the time of the formation of the National government. The following year he became editor of the National Labour party's official organ, The News-Letter, a post he retained until 1938. He was raised to the peerage as Lord Elton of Headington in 1934. His publications include verse, essays, and political writings. A popular broadcaster, he served on numerous committees, e.g. Ullswater Committee on broadcasting, 1935; Road Accidents Emergency Council, 1936-41.

**Elul.** The sixth month of the sacred and twelfth month of the civil year of the Jews, corresponding approximately to Aug.-Sept. It is mentioned in the book of Nehemiah. See Calendar.

**Elutriation** (Lat. *elutriare*, to wash out). Process of obtaining mineral substances in a finely powdered condition by diffusing them in water after they have been ground or crushed. In an elutriator the coarser particles rapidly subside, and the water which still holds the finer particles in suspension is decanted into another vessel and the powder allowed to settle. The process is used for obtaining emery of different grades of fineness, for preparing jewellers' rouge, and other fine sizing processes.

**Eluvial Deposits.** Term used in mining geology for natural mineral concentrations formed, without stream action, upon hill slopes as a result of weathering of metalliferous lodes or rocks that outcrop above them. The heavier and more resistant minerals collect just below the primary source; while the lighter minerals are further removed by the action of rain or wind. This type of natural concentration is not so efficient as that brought about by stream action (see Fluvial Deposits); consequently the primary source must generally be fairly rich itself to give rise to economic residuals.



Eltham, Kent. Exterior of the banquet hall of Eltham Palace, said to have been built by Edward IV

The most important eluvial deposits are of gold, tin, and columbite-tantalite. Gold eluvials are found in Australia, New Zealand, East and West Africa, and the U.S.A. Deposits in Malaysia, Belgian Congo, Australia, and Nigeria are notable contributors to the tin production, whilst those of Nigeria contain columbite-tantalite and occasionally smaller amounts of wolfram. Minor deposits of manganese, kyanite, barite, and gemstones may occur as eluvial deposits.

**Elvan.** Term applied by the Cornish miner and quarryman to any hard rock not typically granite. Whereas it generally refers to dykes of quartz- or granite-porphry, hard epidiorite may be called blue elvan. The porphyries of Cornwall are late granitic injections into the main granite, generally in the form of steeply dipping sheet-like bodies many yards in width. Although similar to granite in mineralogy and chemical composition, they have a different texture. They have relatively large crystals of quartz (quartz-porphry) or of the other essential mineral constituents of granite (granite-porphry) set in a fine-grained matrix of quartz, feldspar, and mica.

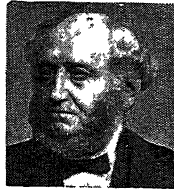
**Elvas.** Frontier city of Portugal, in Portalegre dist. It stands on an affluent of the Guadiana, 170 m. E. of Lisbon and 10 m. W. of Badajoz, on the Lisbon-Madrid rly. It has a Gothic cathedral, a 15th century aqueduct 4 m. long, a Roman castle, and an arsenal. The manufactures include pottery and brandy. The Roman Alpesa or Helvas and the Moorish Balesh, Elvas is an historic place; it held out against the Spanish in 1658 and 1711, but fell to the French in 1808. Pop. 11,747.

**Elver.** Young eel, the stages of whose life history are described under Eel.

**Elverum.** Town in Norway, at the entrance to the Østerdal, the most eastern of the great Norwegian valleys, and an important junction on the Oslo-Trondhjem rly. On April 11, 1940, King Haakon removed from Hamar to Elverum in face of the German invaders, and a few days later the town was reduced to ruins by

aerial bombardment after his refusal to hand Norway over to German control. King Haakon was not injured, and later escaped to Great Britain, but some of his party were killed by machine-gun fire.

**Elvey, SIR GEORGE JOB** (1816-93). British organist and composer. Born at Canterbury, March 27,



Sir George Elvey,  
British organist

1816, he became a chorister at the cathedral and a pupil of the organist. He was organist of S. George's chapel, Windsor, 1835-82. Hewas knighted in 1871, and died Dec. 9, 1893. Elvey's compositions are chiefly church music; he composed the tune of Come, Ye Thankful People.

**Elvey, MAURICE** (b. 1887). Professional name of William Seward Folkard, British actor and stage and film director. He was born in Yorkshire, Nov. 11, 1887. In 1912 he was engaged by Granville Barker as stage director in America for the production of Fanny's First Play. He returned to England and devoted himself exclusively to film production (over 150 films after 1918). He was director of productions to

15, 1866, he was educated at the Oratory School, Birmingham, and Christ Church, Oxford. He abandoned a diplomatic career for singing, and appeared as a professional tenor at Kendal in 1903, and in London with the Handel Society. Possessing superb diction, he sang with great success in oratorio, but more especially in *Lieder*. He appeared regularly at promenade concerts and gave recitals with Fanny Davies (q.v.) in Germany. He died at Boston, Jan. 12, 1921, as the result of a train accident during a concert tour of the U.S.A. Elwes was commemorated by the foundation of a fund to assist young musicians.

His son Simon (b. June 29, 1902) studied at the Slade School, and became a portrait painter, exhibiting regularly at the R.A.

**Elwes, JOHN** (1714-89). British miser. Born April 7, 1714, son of Robert Meggott, on succeeding to the estate of his uncle. Sir Hervey Elwes, he assumed his name. The estate having been much encumbered, habits of frugality had turned Sir Hervey into a miser, and John Elwes proved an apt pupil. Good-hearted by nature, he was kindly to all but himself. He lent money to fellow members when M.P. for Berkshire, 1772-84. After a life of the utmost penury, he died Nov. 26, 1789. He left over £500,000.

**Ely.** Episcopal city, urban dist., and market town of Cambridgeshire, England. It stands on an eminence on the left bank of the Ouse, in the Isle of Ely—which for some purposes ranks as a separate administrative county, with its own M.P.—16 m. N.N.E. of Cambridge. It is famous for its magnificent cathedral. In 673 Etheldreda founded a monastery here for monks and nuns, and became first abbess. It was destroyed by the Danes in 870, and in 970 was refounded as a monastery by Ethelwold, bishop of Winchester.

The present cathedral was begun by Abbot Simeon in 1083. It embraces every style of architecture from Early Norman to Late Perpendicular. It is 537 ft. long and 189 ft. across the great transepts. The W. portion of the nave and W. tower were added in 1180; the fine Galilee or W. porch was completed about the beginning of the 13th century; the choir was

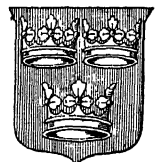


Elvas. Fortifications of the city defending the Spanish frontier of Portugal

Julius Hagen and president of the British Association of Film Directors. He also made pictures in France, Germany, and Hollywood.

**Elvira, COUNCIL OF.** Ecclesiastical assembly held at Elvira in Granada, early in the 4th century. It was attended by nineteen bishops, and put forth about eighty canons dealing with church discipline. It forbade the veneration of pictures in churches, ordered attendance at mass on Sundays, and enjoined celibacy on the clergy.

**Elwes, GERVAASE CARY** (1866-1921). British singer. Born at Billing Hall, Northampton, Nov.



Ely. Arms of the bishop





Ely. The cathedral viewed from the west. The 12th century west tower and Galilee porch; to the right, the south-west transept and tower, of Transitional Norman architecture  
*Photochrom*

erected between 1235-52; the beautiful Decorated octagon tower and lantern (170 ft. high), finished in 1328, took the place of the central tower, which collapsed six years earlier; the lady chapel (now the parish church) dates from 1321-49. Since 1845 the edifice has undergone general restoration. Within the cathedral's precincts are the Tudor bishop's palace, the King's School (1541), and a theological college. Ely became a bishopric in 1109. Market day, Thurs. Pop. 8,500.

**Ely**, MARQUESS OF. Irish title borne since 1800 by the family of Loftus. In 1771 Henry Loftus, an Irish landowner, was made earl of Ely, taking his title from Ely in Fermanagh. The title died with him in 1783, but his nephew, Sir Charles Tottenham, Bart., inherited his estates and took the name of Loftus. He was postmaster-general and was made a baron in 1785. Other Irish honours followed, cul-

minating in a marquessate in 1800, the reward for his support of the union of 1801, when he was made a baron of the United Kingdom.

**Elyot**, SIR THOMAS (c. 1490-1546). English diplomatist and scholar. A native of Wiltshire, he was knighted by Henry VIII and sent on several embassies. His most famous work is *The Book named The Governor*, 1531, the first on the subject of education written and printed in the English language (*consult* edn. H. H. S. Croft, 1880). He also compiled a Latin-English dictionary, 1538. He died March 26, 1546.

**Ely Place**. Cul-de-sac near Holborn Circus, London, E.C. It occupies part of the site of Ely House,

the inn or hostel of the bishops of Ely, of which the church of S. Etheldreda, restored to Roman Catholic worship in the 19th century, was the chapel. John of Gaunt died in Ely House in 1399, and Henry VIII is said to have first met Cranmer here. The church, one of the most perfect examples of Decorated architecture in England, has windows E. and W. with exquisite tracery, and an unreconstructed crypt. Ely House was demolished to the crown under Elizabeth, and transferred to Sir Christopher Hatton.

**Elyria**. City of Ohio, U.S.A., the co. seat of Lorain co. On the Black river, 25 m. W. by S. of Cleveland, it is served by rlys. and an airport. It makes machinery, foundry and machine shop products, steel tubing, air brakes for cars, bicycles, heating and air conditioning units, furniture, leather goods, hosiery, and lace. Settled in 1817, it became a city in 1892. Pop. 25,120.

**Elysée**. Palace in Paris, the official residence of the president of the French republic, in the Faubourg St. Honoré. A garden separates it from the Champs Elysées. It was built in 1718 for the comte d'Evreux, but passed later into royal hands, and was the residence of Madame de Pompadour. Others who lived here included Napoleon I and Napoleon III. After 1870 it became the official residence of the president.

**Elysium** OR THE ELYSIAN FIELDS. In classical mythology, the abode of the souls of the good after death. Some legends make Elysium a part of the underworld, others make it an island or islands in the Atlantic Ocean—the Fortunate Islands or Isles of the Blessed. Elysium is represented as a place of perpetual sunshine with flowery meadows and pleasant streams.

**Elytra** (Gr. *elytron*, covering, sheath). Horny sheaths or cases into which the fore wings have been modified in the beetles and certain other insects. They usually cover the back of the insect, and the hind wings are folded under them. *See* Insects.

**Elze**, FRIEDRICH KARL (1821-89). German student and critic. Born at Dessau, Anhalt, May 22, 1821, he studied at Leipzig and Berlin. Having published a life of Byron (1870), Eng. trans. 1872, and various works on the Elizabethan drama, he was appointed to the chair of English literature at Halle in 1875. His best known work is a biography of William Shakespeare (1876), Eng. trans. 1888. He died at Halle, Jan. 21, 1889.



Sir Thomas Elyot, English diplomatist

*After Holbein*

**Elzevir.** Name of a family of Dutch printers which is given also to some famous books printed by them, e.g. pocket editions of the Greek Testament, Latin and Italian classics, and French memoirs. The firm, founded in Leyden in 1583 by Louis Elzevir (1540-1617), was carried on at Amsterdam by the family, 1638-80, and ended in 1712. The first edition of the Caesar of 1635 is the acknowledged masterpiece in type, ornaments, paper, printing, and purity of text. The publications of the firm dated 1626-1680 are generally the most valuable. More than 150 spurious Elzevirs are known to experts. A fount of type has been given the name Elzevir.

**Emanation** (Lat. *emanare*, to flow out). In philosophy, the theory that all things proceed from a higher original principle (as light from the sun), into which they are again received and absorbed. This form of pantheism, of eastern origin, was adopted by the neo-Platonists and developed by the Gnostics and Cabbalists.

Radium emanation was the name originally given to the inert radio-active gas radon (*q.v.*).

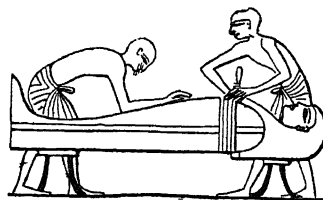
**Emanuel I** (1469-1521). King of Portugal. Born May 31, 1469, he ascended the throne in 1495. He inspired the expeditions of Vasco da Gama, Albuquerque, and Cabral to Brazil, Goa, Malacca, and Sumatra. Under his guidance Portugal became the principal maritime power in the world. He was a persecutor of Jews and a founder of churches and monasteries. He died Dec. 13, 1521.

**Emanuel, WALTER LEWIS** (1869-1915). British humorous writer. Born April 2, 1869, in London, he was educated at University College School and Heidelberg, and became a solicitor in 1896. In 1902 he began writing for Punch his amusing comment on current news entitled *Charivaria*, which he continued regularly for the rest of his life. He died Aug. 4, 1915. His books included *A Dog Day*, 1902; *The Dogs of War*, 1906; *One Hundred Years Hence*, 1911.

**Emba or Yemba.** Non-navigable river of Kazakh S.S.R., in Uralsk government. It rises in the Mugojar hills and falls into the N.E. of the Caspian Sea after a course of about 300 m.

**Embalming** (Fr. *em*, in; *baume*, Gr. *balsamon*, balm). Art of preserving dead bodies. Among the ancient Egyptians, and possibly the Peruvians, embalming originated in the idea of the resurrection

of the body. Herodotus describes three Egyptian methods. In the most expensive process, after removing the brains and intestines the abdomen was rinsed with palm-



Embalming. Egyptian embalmers at work. (From a relief)

wine and filled with myrrh, cassia, and other perfumes, and the incision in the left flank sewn up. The body was then steeped in natron (native sodium carbonate) for 70 days, washed, and wrapped in gummed linen cloths.

A less expensive method was to inject the body with *Kedria* (cedar pitch) in order to remove the intestines, and then steep it in natron. In embalming the poor the abdomen was rinsed in the substance known as *syrmæa* and the body steeped 70 days in natron. Usually the internal organs were embalmed and placed in jars. The Egyptians also embalmed cats, crocodiles, hawks, and other sacred animals and birds.

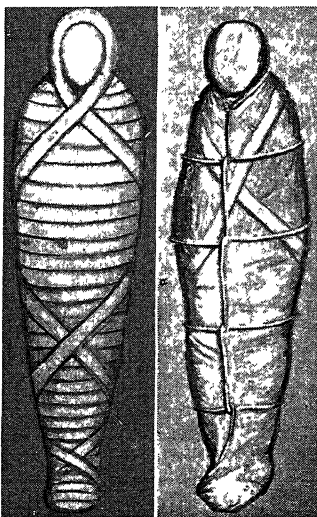
The ancient Persians apparently embalmed with wax, the Assyrians with honey, and the Guanches, the aborigines of the Canary Islands, in the Egyptian manner. Embalming has long been practised

in Europe and is fairly common in the U.S.A. A remarkable modern example of the embalmer's craft was that employed in preserving the body of Lenin for perpetual public display in Moscow, which is said to have been by a secret process. See *Burial Customs*.

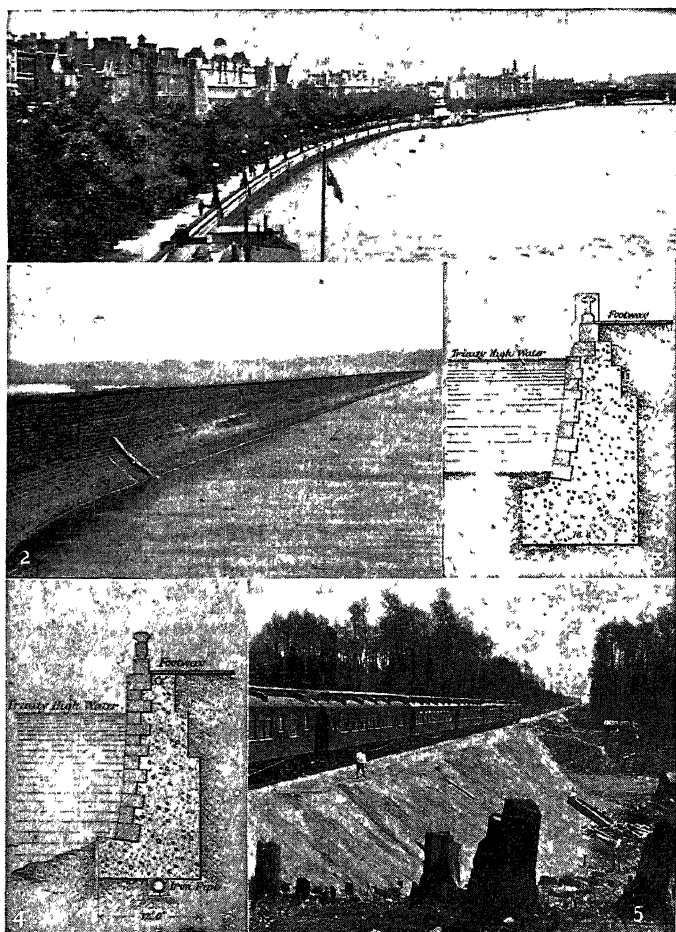
**Embankment.** Mound of loose material artificially formed, or a bank supported by artificial means. There are (a) embankments formed simply by tipping material and allowing the sides to assume the natural angle of repose of the material of which they consist, as in rly. embankments; (b) reservoir embankments for containing and resisting the pressure of water; (c) embankments of earth or similar material retained, supported, and protected by walls, sheet piling, or other means.

Rly. embankments, for the most part of materials excavated in cuttings, serve to carry a rly. across a valley or depression, to avoid steep gradients; they are also constructed to raise the level of rlys. across wide plains, especially where the soil becomes waterlogged, the necessary materials being obtained by excavating material from borrow pits on either side of the line. When formed along the side of a hill a side excavation is usually made, the excavated material being utilised to form the bank portion, the sloping ground under the bank being first cut into steps to prevent side-slipping of the deposited material. Broken stone, gravel, and good sand are the best materials; wet clay and surface soil are liable to cause trouble and expense, as the initial angle of repose may become much flatter, and slips may occur. An embankment should be made higher than its permanent level to allow for subsidence; the allowance varies from  $\frac{1}{12}$  to  $\frac{1}{8}$  of the height. Tipping should always proceed in a forward direction.

In first-class work the slopes are finally covered with surface soil for a depth of a few inches and either turfed or sown with grass seed, as grass binds the surface and tends to prevent washing away by rain. Embankments in still water should have their slopes pitched with stone; if subject to the action of waves or currents they should consist of rubble or be contained by walls. When the water level is subject to fluctuation, the slopes must be protected to prevent material being washed out as the level of the water falls. When a stream of water is encountered, a drain, culvert, or bridge is inserted,



Embalming. Left, inner and, right, outer bandages wrapped by the ancient Egyptians round an embalmed body or mummy



**Embankment.** 1. Thames Embankment, London, looking E. from Waterloo Bridge. 2. Embankment at Belvide reservoir, Staffordshire. 3. Sectional diagram of Thames Embankment at Lambeth, and, 4, at Chelsea. 5. Embankment on the National Transcontinental Rly. at James Bay, Canada

The angle of repose varies with different materials from  $14^{\circ}$  to  $37^{\circ}$ ; the range for materials usually employed is from  $26^{\circ}$  to  $34^{\circ}$ . Owing to the steeper gradients permissible, road embankments are not often necessary on a big scale, but, where constructed, the same rules apply as to railway embankments.

Reservoir embankments consist of earth or similar material lined inside with concrete or stone and rendered watertight by a vertical wall of clay puddle in the centre of the bank, extending from a foundation of impervious material to well above water level. Such embankments have to sustain the side pressure of the impounded water, and are made with slopes much flatter than the natural angle of repose.

A wharf contained by sheet piling with earth filling, or the protection or reclamation of a foreshore or

riparian land by a wall, may constitute an embankment. The term is popularly applied to riverside constructions whereby the banks are protected and retained by walls and have a road and footwalk sometimes ornamented with gardens.

**Embargo** (Spanish). Term in international law meaning a detention of merchant ships in port. It may be used in time of peace as a reprisal for some injury committed by the state to which the ships belong. A state, when war with another is imminent, may also lay an embargo on the ships of that other in its ports with a view to their seizure and confiscation should war break out. It is doubtful, however, whether such an anticipatory embargo is today recognized by international law.

The term is also used in a wider sense to mean any prohibition.

**Embassy Theatre.** London playhouses situated in Eton Avenue, Swiss Cottage, opened on Sept. 11, 1928, under the management of Herbert Jay and Sybil Arundale (*q.v.*). The first production was *The Yellow Streak*, and over a period of some 10 years a number of the plays performed there were subsequently transferred to West End theatres. The theatre, which has a seating capacity of nearly 700, was damaged by a German bomb in Oct., 1940, and was reopened in Feb., 1945.

**Embattled,** **IMBATTLED,** OR **BATTLED.** In heraldry, a line of division, or outline, showing square projections like the crenellations or embrasures of a castle wall. The term crenellated is sometimes used.

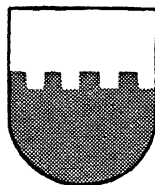
#### **Ember Days.**

In the Anglican and Roman Catholic Churches, fasts of the four seasons. They are the Wednesday, Friday, and Saturday after the 1st Sunday in Lent, Whitsunday, Sept. 14 (Holy Cross Day), and Dec. 13 (feast of S. Lucy). The weeks in which these days occur are called Ember Weeks. They were introduced into England by S. Gregory (590-604). Ordinations in the Anglican Church take place on the Sundays following the Ember Days, and in the R.C. Church on the Saturdays of the Ember Weeks.

**Embezzlement.** In English law, the wrongful appropriation to his own use, by a clerk or servant, of money received by him from his master. It must be distinguished from larceny by a servant. In the latter case the servant steals property which has been in his master's possession; in embezzlement he intercepts it. For example, if a shop assistant receives a shilling for goods sold and simply puts it in his pocket, and does not account for it to his master, it is embezzlement. If he puts it in the till, and then takes it out again and steals it, it is larceny by a servant.

**Emblem** (Gr. *emblēma*, an insertion). Originally meaning an ornament inserted on a mosaic or vase, the term is now generally used for an object or representation symbolic by reason of its connexion with another object, person, or event. It is also used for the marks used by printers to distinguish the work of their press.

In art the emblem has played an important part, especially in the representation of Christian saints, etc. The work of the old masters, and



**Embattled in heraldry**

the pages of old missals, Bibles, etc., are full of such representations. It has been estimated that the emblems of the saints number over 800, or, including variant forms, over 3,000.

Among the commonest are the keys of S. Peter, the sword of S. Paul, the spiked wheel of S. Catherine, the lamb of S. John Baptist, the lion of S. Jerome, the dragon of S. George, the X-shaped cross of S. Andrew, the serpent of S. Patrick, the arrows of S. Sebastian. For the most part these objects are emblematic of the death suffered by the saint, or of miracles attributed to him.

Emblems are also given to various virtues and religious conceptions, e.g. the hand, marked with a cross or sacred heart, is found to stand for labour; a globe, surmounted by a cross and resting on a heart, for the reign of love and concord on earth; a lily for purity and the Virgin Mary. The patriarchs, prophets, and sibyls have their emblems, as Adam with a spade, Moses with the tables of the law, David with harp or sling, or Sibylla Agrippina with a scourge. An early emblem of Christ was a fish, the letters of the Gr. *ichthys*, fish, standing for Jesus Christ Son of God the Saviour. During the 15th century, when heraldry was at its height, armorial bearings incorporating many emblems were devised for almost 100 saints. See Hagiology.

**Emblements.** Term used in English law for the common law right of a tenant whose tenancy is ended otherwise than by his own act to take the crops then growing on the land.

**Embolism** (Gr. *embolos*, stopper, plug). Obstruction of a blood-vessel by material which has been carried along in the blood-stream. The commonest cause of embolism is detachment of a blood-clot or portion of a blood-clot which has formed in a vein. Other substances which may form emboli are portions of growths on the heart-valves resulting from endocarditis, calcareous material from degenerated vessels, pieces of tumours, fat, masses of bacteria, and air bubbles.

Embolism of a coronary artery may cause sudden death; embolism of the brain may lead to paralysis; embolism affecting the main blood supply to a limb leads to sudden pain, swelling, and pulselessness, followed by gangrene in some cases and by recovery in others where other vessels enlarge and replace the blocked circulation. If the embolus contains in-

fective micro-organisms, as, for instance, when it has been broken off from a septic clot, the result is often to set up an abscess where it lodges. Air may accidentally find entrance into the blood-stream during operations involving the large veins of the neck or uterus. When the air bubbles reach the heart they cause an air lock and sudden death.

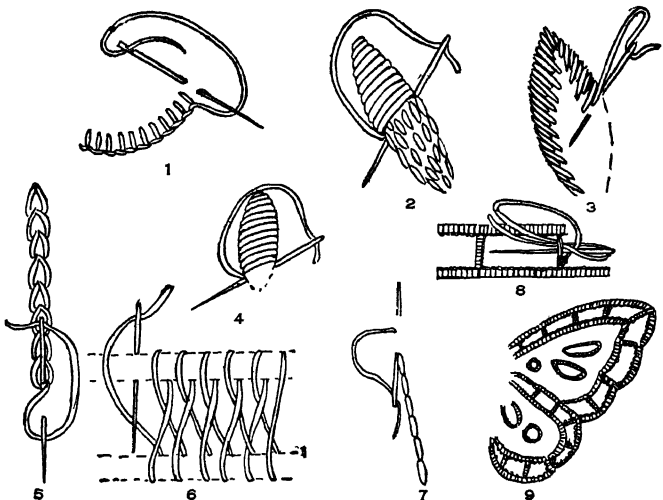
**Embracery.** In English law, an attempt, whether successful or not, to influence a jury in favour of one party to a trial, whether by promise, persuasion, monetary bribery, treating, or the like. The person who attempts to so influence a jury is called an embracery; and the same term is applied to one who comes into court to overawe a jury, or for reward, and speaks in favour of one party. It is a misdemeanour punishable by fine and imprisonment. The word is derived from old Fr. *embracer* (mod. *embraser*), to set on fire, excite; to embrace, meaning to clasp in the arms, is from Fr. *em*, in; *bras*, arm (Lat. *bracchium*).

**Embroidery.** Art of decorating fabric by means of needle and thread. Its practice is of great antiquity; there are references to it in the description of the Tabernacle, and Ezekiel (27, v. 7) mentions "fine linen with brodered work from Egypt." Phrygia and ancient Babylon were renowned for their embroideries. The art was also well known in ancient Greece. In Christian times embroidery became the handmaid of the church. Some vestments still existing at Arles, France, date

from the 6th century. A very beautiful dalmatic in the Vatican, once reputed to be that of Charlemagne, is now attributed to the 11th century. A medieval embroidery that stands alone is the Bayeux Tapestry (*q.v.*).

In the 13th century English embroideries were without equal, and "Opus Anglicanum" was eagerly sought. Examples of magnificent early English coopes are exhibited in Ascoli-Piceno, Pienza, Anagni, Madrid, Toledo, S. Kensington, and elsewhere. French and German embroidery reached a high pitch of excellence during the 13th and 14th centuries, as also did that of the Italian workshops in Milan and Florence.

In W. Europe, in the 16th century, embroidery was both a professional and an amateur handicraft. Elaborate embroidery was used for secular dresses and furniture, and panels and cushions were decorated with cross-stitch or *petit point*. Some magnificent bed-curtains ornamented with trees and large leaves full of elaborate detail were made in the Jacobean period, while embroideries of Charles I's time are characterised by the highly raised style aptly known as stump work. Simplicity marked the early 18th century embroidery, with its powderings of natural flowers worked in chain-stitch on a light ground, and many beautiful samplers of the period yet remain. Under the Hanoverian kings, the highly ornate dress afforded many opportunities for the art of the needle, and the upholstered chairs were covered



Embroidery. Stitches in common use. 1. Buttonhole. 2. Long and short stitches. 3 and 4. Satin. 5. Chain. 6. Eastern or Oriental. 7. Back stitch. 8. Working diagram of cut work shown complete in 9.

with cross- and tent-stitch work. Later the art sank low; copies in embroidery of black-and-white prints and of paintings became the fashion. In the second half of the 19th century the Pre-Raphaelite movement, the revelation of Japanese art, and the study of Eastern examples brought about a change of taste and an improvement in the style of embroidery.

Modern embroidery can be divided into two sections: machine embroidery and hand embroidery. Machine work is used principally for the adornment of dresses, lingerie, millinery, and furnishings. Various embroidery machines have been invented, the most popular being the single-needle type, similar to the ordinary sewing-machine. The first successful machine, invented by Josué Heilmann of Mulhausen, was patented in England in 1829. On this machine it is possible for one person to guide from 80 to 140 needles working simultaneously and producing repeats of the one design. The Bonnaz machine, patented in Great Britain in 1868, does chain-stitch, braiding, and cording. As modified by M. E. Cornelly, it does in addition gimp and retard stitch.

Hand embroidery is of many different kinds. In appliqué work, one material is applied to another by means of fancy stitchery. There are two forms of this work, onlay and inlay. Assisi embroidery is a variation of cross-stitch embroidery; the design is outlined and the background is filled with crosses. Cross-stitch, tent-stitch, *petit point*, and *gros point* are usually worked on canvas.

Cut-work or Swiss embroidery, with open groundings such as Madeira, Renaissance, Richelieu, and Venetian embroidery, is used on fine cambric and linen. Drawn-thread work and needleweaving are of peasant origin; the threads of either the warp (or the weft) of the material are drawn, and the weft (or warp) threads are worked into a pattern. Florentine embroidery, of Italian origin, is composed of vertical zigzag lines of shaded stitches. Hardanger embroidery, the famous embroidery of Norway, is a mixture of satin-stitch and drawn-thread work. Jacobean embroidery is worked in wools, usually on stout twilled fabric suitable for panels and furnishings. This design gives scope for various fillings and shades of wool.

Metal-thread embroidery, used in the 17th and 18th centuries for the decoration of ecclesiastical

ornaments and vestments, now appears on official costumes and civil and military badges. The term *passementerie* covers the making of cords, fringes, tassels, and buttons for the trimming of dresses and for furnishings. Tambour or Luneville work—the attaching of beads, bugles, and sequins to materials by means of a hook—is done on an embroidery frame.

In quilting, two or three layers of material are held together by stitching in a decorative design. There are two kinds, English and Italian, the latter having a cord or wool inserted in the design to produce a pattern in relief. In England and Wales, quilting remains a national art.

Smocking is a method of gathering a width of material into regular folds which are secured by decorative stitchery. This is of peasant origin, and many beautiful specimens can be seen on Hungarian national costumes.

The names of the principal stitches used in hand embroidery are: stem, back, split, chain, cable, couching, herringbone, fishbone, buttonhole, satin, daisy, long and short, French knot, darning. See Needlework.

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ed., 1914; *Embroidery through the Ages*, Mary Symonds, 1928; *Dictionary of Embroidery Stitches*, Mary Thomas, 1934; *Embroidery Design and Stitches*, Kathleen Mann, 1937; *English Medieval Embroidery*, A. G. I. Christie, 1938.

**Embrun.** Town of France. It stands above the Durance in the department of Hautes Alpes, being nearly 3,000 ft. high, 27 m. by rly. S.S.W. of Briançon. Although a small place it has much historic interest. It was once the seat of an archbishop, and its magnificent cathedral, built in the 12th century, remains. Dedicated to Notre Dame, this has a fine tower. The palace of the archbishops is now used for public purposes, and there is an old tower, a relic of the fortifications which were pulled down in 1884. Pilgrims visited Embrun in the Middle Ages to venerate a picture of the Madonna painted on the cathedral door. A large Roman station, the place became a bishopric soon after 300. The bishops (later archbishops) were princes of the Empire and rulers of an extensive territory. The see was transferred to Gap in 1791.

**Embryo** (Gr. *en*, in; *bryein*, to swell, teem with). In a general sense, an undeveloped idea or conception, the initial stage of anything. In biology it is the living creature which develops in the egg or womb; in botany, that part of the seed from which the plant is formed.

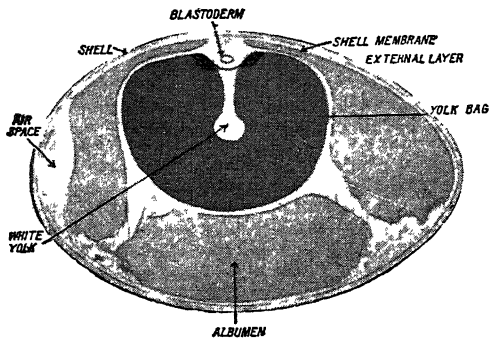
## EMBRYOLOGY: STUDY OF THE EMBRYO

Comyns J. A. Berkeley, Lecturer in Biology, Chelsea Polytechnic

*This article explains the scope of Embryology, which studies the development of the individual in its early stages, before it has become recognizable for what it will be, except to the expert. See also Biology; Eugenics; Evolution, Life, etc., and biographies of Darwin, Lamarck, Mendel, etc.*

Embryology (Gr. *embryon*, embryo; *logos*, science) is the science of the development of the individual in its early stages. This process starts in a single cell and is accomplished by the multiplication of that cell together with the growth and differentiation of the products of division till ultimately the complex structure of the young organism is apparent. In typical instances the single initial cell is the result of the union of two gametes, which in all but the simplest organisms differ. One, the female gamete, is relatively large and non-motile, the other, the male gamete, is relatively small and usually motile. It is the fusion of these two cells, fertilisation, which normally sets in motion the processes of embryo building.

**ANIMAL EMBRYOLOGY.** The egg cell or ovum. In most animals, egg cells are formed by the multiplication of primordial germ cells within the ovary of the parent. Some of the products of this multiplication ultimately become eggs (see Gametogenesis); but it frequently happens that a developing egg absorbs its sister cells or that they form a protective covering (follicle cells) for it. Thus, in the ovary of the fresh water polyp, hydra, and the marine tubularia, one egg only of the original many survives. A ripe egg is almost without exception spherical, or nearly so, and contains one haploid (*q.v.*) nucleus. It is large relative to most body cells owing to the accumulation within it as it develops of food reserve or yolk. The quantity of



Embryology. Hen's egg shown in section

this varies as does the size of the egg, which is about 1.6 mm. in diameter in the case of the frog, 1.7 mm. in man, and 0.06 mm. in the mouse.

Around the egg are eventually formed envelopes of various kinds which are derived from the egg itself, the follicle cells, or from secretions of the oviduct. What is normally called a bird's egg consists of the egg cell enormously dilated with yolk, surrounded in turn with a follicular envelope, a large amount of albumen (or white of egg), a thin shell membrane, and a porous shell.

**Spermatozoa.** Primordial germ cells multiply in the male organs to form numerous haploid spermatids which change their shape to become spermatozoa. These are extremely minute and typically consist of a head, chiefly nuclear, and a tail, by which the cell propels itself through liquid, sometimes a simple lash but frequently having a fin of cytoplasm running down most of its length. Its total length varies considerably in different species, being 50–60 microns in man, 20–27 microns in the crocodile, and in siredon some 360–430 microns. Differences occur in detailed structure, and some sperms have no tail.

**Fertilisation.** Contact between the two gametes is normally effected by the movement of the male gamete, which pierces the egg with its head. Thereafter, movement of fluid in the egg cytoplasm seems, in some instances at least, to carry the sperm inwards till it is in a position to unite with the egg nucleus. When this has occurred fertilisation is complete, and it results in (a) a change in the surface of the egg which inhibits the entrance of further sperms, (b) a mingling of the heritable material of the two gametes with the consequent formation of a diploid

nucleus for dividing to form the body cells of the new animal, and (c) a stimulus to the egg to divide.

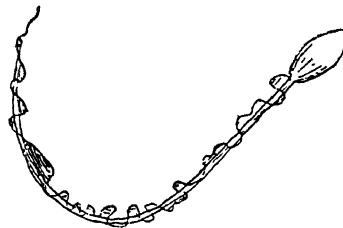
**Embryo development.** *Segmentation.* Soon after fertilisation has occurred the egg cell nucleus divides, and the rest of the cell follows suit. The process is repeated, the two cells resulting from the first division dividing to form four cells, the four to form eight, and so on. Eventually many cells or blastomeres are produced by this process of segmentation, which differs in detail according to the amount and distribution of yolk

the other. The result is to produce at first a ball of cells, which may be solid (morula stage), or may develop an internal cavity as it forms. Such a cavity or blastocoel is seen at the blastula stage in the frog embryo. Here it is floored by a hemispherical mass of larger yolky cells and roofed by a hemispherical dome of smaller cells. Alternatively, when yolk is abundant, as it is in birds, reptiles, and fishes, cell divisions may take place at first at one side of the egg only to produce there a plate of cells, or blastoderm, lying on the yolk.

**Formation of germinal layers.** In the developing embryo, be it of the blastula or blastoderm type, there are soon apparent groups of cells from which definite kinds of tissues and organs arise. These groups of cells are the germinal layers. In sponges and stinging animals, there are two fundamental cell groups

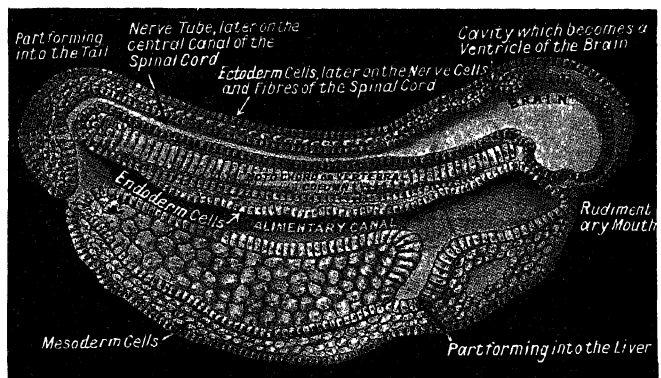
which become apparent as the two layers of the wall of

the gastrula, formed as if by the in-dimpling of one side of a blastula till that side makes contact with the other. The outer layer is the ectoderm, the inner the endoderm. A third layer or mesoderm is formed in vertebrates and in these the endoderm and ectoderm are established in a somewhat different manner. In the frog some of the smaller cells of the blastula, close to the yolk cells, tuck themselves in so that there is formed a lip overhanging the yolk cells. It is as if the skin of a soft toy balloon had been pinched to bring the inside of one part into contact with the inside of a neighbouring one. This process of intucking is progressive, but for simplicity it may be imagined that the two layered lip which is thus formed



Embryology. Spermatozoon of man. Above, that of a horse

in the eggs. The whole egg, when it contains relatively little yolk uniformly distributed, may be involved and the cells formed all of a size, as in the sea urchin; or, when scanty yolk preponderates on one side of the egg, as it does in that of the frog, divisions may be unequal to give larger cells on the yolk side than on



Embryology. Sectional view of the embryo of a frog, illustrating how the brain, spinal cord, vertebrae, and alimentary canal are among the earliest parts of the developing animal to form



grows downwards and round the yolk and concurrently spreads sideways to become crescentic, semi-circular, and even more curved, till finally its corners meet and the lip forms a circular aperture. It is only within this aperture or blastopore that the main mass of the yolk cells is now exposed. Elsewhere it is completely covered by two layers of cells, ectoderm outside and endoderm inside, initiated by the lip. The process of envelopment has resulted in a new cavity. This is the archenteron and corresponds with the future alimentary canal. Between the endoderm and the ectoderm the mesoderm appears later.

In those embryos where segmentation leads to a plate of cells at one side of a large yolked egg, a lip develops in a somewhat similar fashion, either at the edge of the blastoderm or within it, and initiates germinal layers, an archenteron being less well developed in the higher forms.

**Differentiation.** When the germinal layers are established, the structure of the individual cells is simple; but thereafter changes in the form of cells and in their arrangement lead to the initiation of tissues and organs. Certain groups of cells and organs of the mature organism are regularly traceable to one or other of the germinal layers. Thus, the ectoderm regularly gives rise to the skin and the nervous system, the endoderm to the alimentary canal, lungs and liver, and the mesoderm to the skeleton, muscles, and vascular system.

**Foetal membranes.** As the embryo develops on one side of the egg from the blastoderm, this spreads, tending to enclose the yolk. In some instances, *e.g.* in fishes, enclosure occurs and there is thus formed a closed yolk sac attached to the ventral side of the embryo with its cavity continuous with that within the embryo itself. During the embryology of the more highly evolved vertebrates, membranes in addition to the yolk sac are derived from the extra-embryonic parts of the blastodisc. In birds, for example, the central region of the blastodisc only grows into the embryo. The marginal parts unfold the embryo in a two-walled, fluid-filled sac which serves as a water bath and cushion for it. The wall of the sac next the embryo is the amnion, and its inturned neck is joined to the edge of an aperture or umbilicus in the ventral side of the embryo. The outer wall of the sac is the false amnion or

chorion. Its neck may be considered as united with the edge of an uncompleted yolk sac, and by means of this joined through the umbilicus into the ventral side of the embryo also. Between the insertions of the amnion and the yolk sac, part of the developing hind gut of the embryo protrudes to form yet another sac, the allantois, which may enlarge until it completely fills the space between the amnion and the chorion.

**Placenta.** In placental mammals, the fertilised egg divides to form a morula. The surface layer of this separates, in the blastocyst stage, as the false amnion, from the inner mass or embryonic knob. Part of the false amnion becomes attached to the lining of the female parental uterus as a trophoblast (nutritional sac) to initiate the placenta, and the embryonic knob develops into the embryo with its amnion, yolk sac, and allantois. Parts of these become intimately associated with the false amnion and the uterine wall in the developing placenta to which the embryo is attached by their connexions (umbilical cord) with its umbilicus, the allantois ultimately forming the principal placental union.

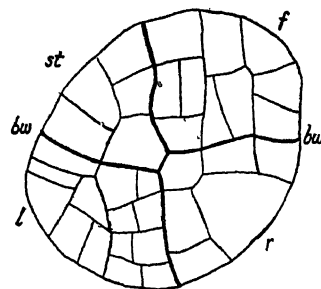
**PLANT EMBRYOLOGY.** *The Egg cell or Oosphere.* In relatively simple plants, oospheres are formed in oogonia, which are simple sacs, and the egg cell contains food reserve sufficient for its early post-fertilisation development. This process, however, usually results in a young independent plant without the intermediate formation of any recognizably peculiar embryonic stage. In the more complicated plants, egg cells are differentiated from among a number of other haploid (*q.v.*) cells constituting the gametophyte (*see* Alternation of Generation; Reproduction). During this differentiation, cells of similar origin may become specialised as archegonium wall cells, to contain the egg, or as canal cells of archegonium, or synergidae of embryo-sac, to facilitate the access of the male gamete. In such plants, material for embryo growth is supplied by the gametophyte, or, when this is scantily developed as it is in flowering plants, from the parent sporophyte direct.

**Male gametes.** These, like oospheres, are specialised gametophytic cells. Like the sperms of animals, they consist mainly of nuclear material. In most plants which form archegonia, the male gametes are antherozoids, formed in antheridia, and are motile by

means of cilia or flagella. Such motor organs are lacking in all but a few gymnosperms and in all angiosperms. The male cells of these plants are formed as the pollen germinates and are carried along in the cytoplasm of the pollen tube as it grows.

**Fertilisation.** Many antherozoids are known to exhibit chemotaxis (*q.v.*) and reach the oospheres by swimming through water to the neck of the archegonium, burst open in most instances by the conversion of the canal cells into mucilage through which entrance to the egg cell can be accomplished. Male cells of most gymnosperms and all angiosperms are conveyed to the eggs by the growth of pollen tubes which are guided by chemotropism into the necks of archegonia or between synergids. In all typical instances, fusion of the nuclei of male and female gametes initiates embryo development but, in angiosperms, a second nuclear fusion occurs, between a second male nucleus from the pollen tube and two polar nuclei, present in the embryo-sac cytoplasm, to produce the primary endosperm nucleus. From this there is later formed a triploid tissue, endosperm, peculiar to angiosperms, which may persist as a food reserve for the use of the embryo when the seed germinates.

**Embryo development.** In pteridophytes (fern-like plants) the oospore (fertilised egg) is contained in the venter of an archegonium projecting from the surface of the gametophyte plant. In some the oospore divides by a "basal" wall to form the first two cells of the embryo. Each of these cells

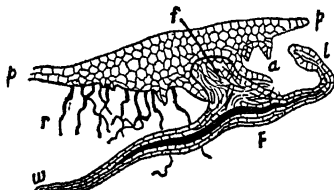


Embryology. Drawing of an embryo of *Adiantum* as seen from one side: bw, basal wall; st, stem apex; l, leaf apex; t, foot; r, root

divides again twice by walls at right angles to the basal wall and to one another so that there is produced a ball of eight cells—octants. Each of the octants divides repeatedly and during these divisions a

stem apex is initiated close to the intersection of the third and fourth walls with the surface of the embryo. This stem apex may be initially directed, according to the orientation of the basal wall, away from the prothallus (e.g. *Equisetum*) or obliquely sideways (e.g. leptosporangiate ferns) or towards the prothallus (e.g. *Marattiaceae*).

**Suspensor and foot.** In other pteridophytes (e.g. *Lycopods*), the first wall dividing the oospore, laid down usually at right angles to the axis of the archegonium, separates an outer "suspensor" cell from an inner embryo cell. The former by its enlargement serves solely to thrust the embryo cell into the nourishing prothallus: the latter undergoes further divisions to form octants, and later a stem apex, as in the instances already described. Whether or not a suspensor is formed, the young embryo develops in intimate association with the prothallial cells, and as it does so, part of it may become a mass of cells, called a foot, especially adapted to absorb nourishment from them. Near the stem apex a rudimentary leaf or cotyledon is formed which later grows upwards to expand its lamina in the light for photosynthesis, and between the cotyledon and any foot which may arise a root apex is established



Embryology. *Adiantum capillus veneris*, longitudinal section through prothallus, p, p, and young fern, f; r, rhizoids; a, archegonium of prothallus; f, foot; l, first leaf; w, first root of embryo

which grows into the soil as the first root. As soon as the cotyledon and the root are functioning adequately, the young plant is independent of the prothallus, which shrivels.

**Proembryo.** In seed plants the oospore divides to form a proembryo, only part of which is concerned in the production of the embryo proper. In the cycads the proembryo is an extensive tissue formed by free cell formation from the whole egg, but in the conifers it consists of relatively few cells, in the pines being derived from one end of the egg only. In most gymnosperms a middle portion of the proembryo elongates considerably as a suspensor to carry the

apical embryo cells deep into the female prothallus which constitutes the main bulk of the developing seed. Multiplication of embryo cells subsequently results in the embryo proper with its radicle directed towards the suspensor and its plumule or leading bud pointing in the opposite direction and surrounded by two or more cotyledons. Such embryos embedded in female prothallus and surrounded by seed coats remain dormant until the seed is dispersed and until, conditions being suitable, they continue their development into seedlings during germination.

**Endosperm.** In angiosperms the egg cell occupies a position at the micropylar end of the embryosac of the ovule. This sac also contains its own cytoplasm in which are two polar nuclei. Fertilisation is a two-fold process. Two male nuclei emanating from the pollen grain are concerned. One fuses with the oosphere nucleus and the other with the two polar nuclei. From the fertilised egg there is formed a proembryo, a thread of cells which comes to project into the middle of the embryosac. The innermost cell of this row is chiefly responsible for the formation of the embryo, which thus begins its development in the cavity of the embryosac. The remainder of the proembryo is the suspensor, and shrivels as the embryo completes its development.

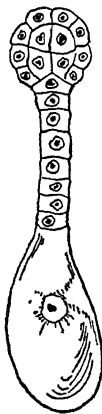
While these changes are taking place in the oospore, the primary endosperm nucleus divides to produce many nuclei that are centres for the organization of endosperm cells within the embryosac wall. These cells tend to increase in number so as to encroach on the embryosac cavity within, and the nucellus of the ovule without, the measure of the inward encroachment accomplished depending to a degree on the relative speeds with which the embryo and the endosperm grow.<sup>3</sup> Should the embryo develop relatively slowly prior to seed dispersal, it may, at that time, be a mass of meristem cells either in the form of an undifferentiated plug or showing differentiation of radicle, one or two cotyledons, and perhaps a plumule, embedded in endosperm tissue whose substance

is absorbed during germination. Alternatively, with relatively more rapid development some part of the embryo such as the cotyledons or the hypocotyledon stem may absorb the endosperm-forming substance as it comes into the embryosac from without, the embryo cells maturing accordingly, and the seed coming to contain no endosperm when it is ripe.

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**Emden.** Town and seaport of N.W. Germany, in the Hanoverian part of the new Niedersachsen state. It stands at the N. of the Dortmund-Ems Canal which links the Ruhr with the sea. This port was the fourth largest in Germany, with an average peace-time turnover of more than 20,000 vessels. Ruhr coal, Swedish iron ore, grain, timber, and fish were the main goods passing through. Fish curing and trade based on the surrounding agriculture and cattle breeding were other concerns. Under the Nazi regime Emden was developed for war purposes, and a submarine base and yards were created, which attracted heavy air attacks during the Second Great War.

The town itself, the central parts of which preserved with their canals and gabled houses a Dutch character, was founded in the 10th century, was given urban rights in the 14th, and became wealthy. In 1402 it fell to Hamburg. It was a free city of the Empire under Dutch protection in 1595, having benefited from the transfer of English warehouses from Antwerp to Emden. Part of Prussia from 1744, it was made a free port by Frederick the Great. After suffering from blockade during the Napoleonic wars, it belonged to Hanover 1815-66, and then reverted to Prussia. A fine town hall in Flemish style (1576), and the Great Church (12th century), were both wrecked in the Second Great War. The town was occupied by the 3rd Canadian div. on May 7, 1945. Pop. 34,111.



Young embryo of shepherd's purse at end of suspensor

**Emden.** Name of a series of German light cruisers. The first, of 3,600 tons, launched in 1908, became famous at the outbreak of the First Great War for the damage she did to British and Allied commerce and for the humanity shown by her commander, von Müller, to the crews of the ships he sank. The Australian cruiser Sydney, learning that the Emden was at Cocos Island, drove her ashore on North Keeling Island and destroyed her with a loss of 230 on Nov. 9, 1914. Müller was saved and allowed to retain his sword. This was the first action by a ship of the Australian navy.

Another Emden was built in 1915, was surrendered to the Allies after the armistice, and in 1920 was allotted to France. A third, completed at Wilhelmshaven in 1925, was one of the earliest units of the new German navy. She displaced 5,400 tons on a length of 508 ft., had eight 5.9-in. guns, and could sail at 29 knots. She was used as a cadet training ship, but going into action in the Second Great War was rendered useless by a Norwegian minelayer on April 10, 1940.

**Emerald** (Gr. *smaragdos*, Fr. *émeraude*, Span. *esmeralda*). Green variety of mineral beryl, a metasilicate of beryllium and aluminium with traces of chromic oxide, found in granitic or schistose rocks, and in veins traversing them, also in bituminous limestone (Colombia). It crystallises in hexagonal system, and forms long six-sided prisms; it is valued as a gem-stone when clear and well coloured. Perfect crystals are rare; many stones show "mossiness" due to tiny fissures and air bubbles, while the colour is often irregularly distributed. Emeralds of antiquity came from Egypt; its mines, reopened in the 19th century, yield handsome stones, though generally small and rather pale. The finest crystals come from S. America, chiefly Colombia, and from the Urals; a few are found in Austria, Australia, and the U.S.A.

Certain other stones are known as emeralds. The rare "oriental" emeralds are green corundum; "Brazilian" are green tourmaline; "Uralian" are green garnet; "evening emeralds" are bottle-green olivine; "false" are fluorite; while "mother of emerald" is green quartz, and "emerald copper" is diopase (a green silicate of copper).

Artificial emeralds are made by fusing together 4,608 parts of

strass, 42 parts of copper oxide, and 2 parts of chromic oxide. A finer quality, known as "synthetic" or "scientific" emeralds contains 7-8 p.c. of beryllia, but although almost identical, these are of lower specific gravity and refractivity than the true stones, and are almost always "cloudy" or "mossy." "Emeraldines" are artificially coloured chalcedony.

**Emerald Green.** Name applied to certain green colouring matters. The two mineral emerald greens are aceto-arsenite of copper and hydrated chromium sesquioxide. The aniline dye emerald green is prepared by the action of benzaldehyde upon diethylaniline, and subsequent oxidation.

**Emergency Powers Acts.** British Acts of parliament providing for special administration in time of emergency. An Act of 1920 gave the king power to declare a state of emergency, and the govt. power to deal with it, should action be taken or threatened calculated to deprive the community of the essentials of life. Such a state of emergency was declared in 1926 (see General Strike), and in 1949 during an unofficial strike of London dockers. Under the Emergency Powers Act, Aug. 24, 1939, Defence Regulations (*q.v.*) were issued during the Second Great War.

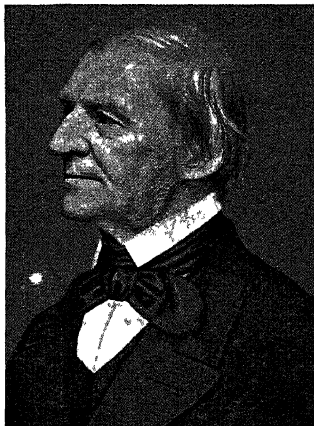
**Emerson, RALPH WALDO** (1803-82). American poet, essayist, and philosopher. He was born at Boston, Mass., May 25, 1803, the son of a Unitarian minister, and was educated at the Boston Latin school and Harvard. After graduating in 1821, he spent three years in teaching, and then, having entered the Unitarian

ministry, was appointed joint minister of the Second Church in Boston, 1829. He married Ellen Louisa Tucker, who died in 1832, and in that year resigned his ministry in consequence of his widened views, to which he had given expression in a sermon on the Lord's Supper (Works, vol. xi, 7), which did not meet with the approval of his congregation.

In 1833 Emerson travelled in Europe, visited Carlyle, and began that lifelong friendship with him which bore literary fruit in a notable collection of letters. On returning to America he settled at Concord, Mass., and entered upon his career as writer and lecturer, which, in a few years, was to place him in the front rank of American men of letters. The year after settling in Concord, he married Lydia Jackson (1802-92). In 1836 he published a slim volume, *Nature*, in which he briefly stated the case for a new outlook on things in place of the continued acceptance of mere tradition. In subsequent addresses, lectures, and essays, the thoughts enunciated in *Nature* were enlarged upon and developed. In 1840 he commenced writing for *The Dial*, and edited it for two years; this magazine came to be regarded as the special organ of the New England Transcendental movement in religion, literature, and philosophy.

The first volume of those essays by which he was to become most widely famous was published in 1841; a second followed three years later. In 1847 the first collection of his poems was published, and in the autumn he revisited England on a lecturing tour, delivering a series of addresses on Representative Men—Plato, Swedenborg, Montaigne, Shakespeare, Napoleon, and Goethe. The volume containing these addresses was published in 1850. In 1856 the fruits of his observation during his extended stay in England were embodied in *English Traits*.

Writing and lecturing, he came to take a high position as the chief leader of American thought of his generation, and, despite some unfavourable comment on his somewhat staccato literary style, to be recognized in England as a great, suggestive, and stimulating writer. In 1872, his house at Concord was partly destroyed by fire, a disaster which caused him a severe shock; it was, however, rebuilt by his friends and admirers, and he sought health by revisiting Europe. He died at Concord,



*R. W. Emerson*

where his house still stands, on April 27, 1882, and is buried in its famous cemetery of Sleepy Hollow.

The work which Emerson left, alike in prose and in poetry, is peculiarly individual. He was, perhaps, essentially a poet, but only in a small degree a singer; his verse, often marked with penetrating thought and lofty conception, is, for the most part, lacking in beauty of form or music. His philosophy is that of the moment's consideration rather than of any fully developed scheme; is, indeed, the philosophy of the poet rather than of the scientist. Less as master of any definite course of philosophy than as a stimulator of thought along idealistic and optimistic lines did he exercise great influence on his time. His position in this respect is perhaps best summed up in the words of Richard Garnett: "More than any of the other great writers of the age he is a Voice. He is almost impersonal. He is pure from the taint of sect, clique, or party. He does not argue, but announces; he speaks when the spirit moves him, but not longer. Better than any contemporary, he exhibits the enigma how Confucius and Buddha and Socrates and greater teachers still should have produced such marvellous effects by mere oral utterance." The effect of his work, it has been said, is that of good and stimulating conversation; but it is conversation on a high and impersonal plane. His utterance has something of a finely-balanced sanity, and though at times it may suggest the mystic, it is the mysticism of a glorified common sense, not that of mere nebulousity.



Emerson. The old manse at Concord, Massachusetts, where Emerson settled in 1833, and where Nathaniel Hawthorne lived during 1842-46

as black granular masses found in crystalline limestones or aluminous sediments as the result of metamorphism, or in residual deposits concentrated during the weathering of such rocks. The chief deposits occur in Naxos, Greek Archipelago; Aidin, Asiatic Turkey; and the Central Urals, U.S.S.R.

The toughness and hardness of emery make it a good abrasive and it is used in the manufacture of paper, cloth, and wheels. Emery wheels were once much used for grinding, but have largely given place to such artificial compounds as carborundum (*q.v.*) or aluminium oxide, bonded and made into grinding stones and wheels. Emery paper and emery cloth, coated with emery powder, are used for cleaning and finishing metalwork; emery powder as an abrasive in domestic and industrial work. In all these fields the newer abrasives mentioned are taking the place of natural emery. See Grinding.

**Emery**, WINIFRED (1862-1924). Stage name of Isobel Winifred Maud Emery Maude, British actress. Born at Manchester, Aug. 1, 1862, in 1888 she married Cyril Maude (*q.v.*). Her first appearance on the stage was at The Amphitheatre, Liverpool, 1870, as Geraldine in *The Green Bushes*; her first London appearance was in pantomime at The Princess's, 1874. A versatile actress, she appeared with Wilson Barrett, Comyns Carr, Forbes Robertson, and Beerbohm Tree. She accompanied Henry Irving to the U.S.A. in 1884 and 1887-88. She died July 15, 1924.

**Emetic** (Gr. *emetikos*). Substance administered medically to cause vomiting. Emetics are occasionally used in cases of simple illness. Dyspepsia and sick headache caused by excessive eating

may sometimes be relieved by emptying the stomach of its contents. Another use is in conditions of difficulty of breathing caused by bronchitis, especially in children, the act of vomiting stimulating the respiratory mechanism and relieving the distress.

The chief use of emetics is to remove poison from the stomach. This form of treatment may be adopted with safety in almost all cases where poison has been swallowed, except poisoning from strong mineral acids which corrode the stomach wall and render violent movement of the organ undesirable. Some knowledge of emetics should be possessed by every household, for the prompt administration of an emetic may avert serious symptoms, and even save life which would be lost if treatment were delayed. The simplest emetics are a tablespoonful of mustard, or one or two tablespoonfuls of salt, in a tumbler of warm water. The following emetics should be taken only under medical advice.

Zinc sulphate: 10 to 30 grs. dissolved in half a tumbler of warm water, repeated if necessary. Ammonium carbonate: 15 to 30 grs. dissolved in warm water. Ipecacuanha: four to six drams of the wine, or 20 to 30 grs. of the powdered root.

Apomorphine is best administered hypodermically in doses of  $\frac{1}{16}$  gr. This emetic stimulates the nerve centre in the brain which controls the process of vomiting; it is particularly useful in poisoning by narcotics such as opium.

**Emetine**. Chief alkaloid found in the roots of *ipecacuanha* (*Cephaelis Ipecacuanha*). It is extracted from finely-powdered root by means of alcohol or other solvent to remove the total alkaloids. The solution is then extracted with dilute hydrochloric acid, which in turn is extracted with ether after adding ammonia. The ethereal solution is extracted with sodium hydroxide and concentrated. The residue is converted into hydrochloride, hydrobromide, or hydriodide, whereupon the emetine salt crystallises out. Emetine may also be obtained by the methylation of cephaeline, another alkaloid of *ipecacuanha*. It is a violent emetic, but in medicine is considered a specific remedy for amoebic dysentery.

**Emigration** (Latin *em*, from; *migrare*, to change one's residence). Systematic migration of the surplus population of one land to another for the purpose of per-

#### Walter Jerrold

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**Emery** (Sp. *esmeril*). Mineral composed of corundum (aluminium oxide) with much iron present, mainly as admixed iron minerals, *e.g.* magnetite. It is therefore not properly a true mineralogical variety. It occurs

manent settlement. This movement has been one of the great factors in shaping the world, more potent even than military conquest. The ancient world witnessed vast migrations of people in quest of food and living space and under the pressure of climatic changes: such was the Teutonic surge westwards over Europe to the Atlantic border. The dispersal of the Jews, especially after the destruction of Jerusalem, was a migratory movement of a different kind.

After the discovery of America, emigration developed contemporaneously with the era of the merchant adventurers. Spain led the way, absorbing enormous areas in S. America and in the southern half of N. America. Portugal and Holland played a part, but Spain's main rivals were France and Great Britain. The enterprise of the merchants of Bristol gained a foothold in Newfoundland from which the British people spread to the Pacific in the W. and Mexico in the S. Everywhere, but especially in N. America, French and British found themselves rivals in the race for new lands.

Religion played a large part in the first emigration movements. Zeal for the Catholic Church led Spain to attempt to establish on a large scale model Catholic nations in S. America. The effort to create new peoples to overcome the growing heresies of Europe influenced the French kings in their pious endeavours to build up New France along the banks of the St. Lawrence. The departure of the Pilgrim Fathers from Plymouth in 1620 for New England laid the foundations of the U.S.A. A second great impelling force was poverty; and a third political discontent. The most marked example of these was the steady exodus of the Irish people to America during the famines and troubles of the 19th century. A fourth cause is love of adventure and ambition, of which the most striking instance is to be found in emigration from Britain.

As Spain and Portugal declined, the outflow of their peoples ceased. The Dutch settlers in N. America were gradually absorbed by their English-speaking rivals. S. Africa remains the outstanding example of successful Dutch settlement. The people of France, defeated in their struggle for supremacy in N. America after the Seven Years' War, became one of the least migratory nations in Europe, but the province of Quebec still re-

mains distinctively French under the British flag. Britain maintained the outpouring of her people. While she lost political control of a large part of N. America, the U.S.A. retained the English language, and the British stock predominated. The convict settlements of New South Wales and Tasmania gave way to the free British commonwealth of Australia. The growth of Australia and the opening up of the Pacific coast of N. America were enormously stimulated by the discovery of gold in California and Victoria in the middle of the 19th century.

The defeat of the liberal movement and the triumph of imperialism in Germany stimulated a German migration westwards, which militarism and poverty did much to encourage. The German emigrants before the First Great War went mostly to the U.S.A. and to S. America. After the war their migration to the U.S.A. was checked, and they tended to go in larger numbers to S. America, Poland, and W. Russia.

Abundant industrial openings and high wages in the U.S.A. made it the Mecca of the European emigrant. The flow of population across the Atlantic early in the 20th century averaged 1,000,000 a year; three-quarters came from Russia, Italy, and Austria-Hungary. By 1938 the net inflow was down to 30,000. Despite the immigration from Continental Europe, the most considerable section of the foreign white stock in the U.S.A. is from the British Isles. Canada failed to draw any considerable number of new settlers until near the close of the 19th century. Then, partly on account of the closer settlement and growing scarcity of land in the U.S.A., a big movement, largely of farmers, started from there into the prairie provinces.

One of the most significant movements of emigrants during 1920-40 was the large Japanese emigration all over the Pacific coast and islands due to the rapid growth of Japanese populations. This gave rise to serious difficulties with the white nations of the Pacific, more particularly with the people of California, who caused deep offence in Japan by passing exclusive legislation. A similar policy was adopted by Australia. A great part of the movement of emigration in earlier years was uncontrolled by governments, but economic and political stresses have increasingly led governments to regulate the settlement of aliens.

Most countries have adopted immigration quotas, limiting the inflow to settlers of certain types or occupations. To assist British subjects of suitable categories to emigrate to the dominions, an Overseas Settlement department was set up in 1922, and schemes of assisted emigration were drawn up by the dominions themselves.

The period, which included the preparations for the Second Great War, the war itself, and its aftermath, was marked in Central Europe by forced migrations on a large scale. A solution of acute minority problems (e.g. that of Sudeten Germans in Czecho-Slovakia) was sought by dispossessing those of the minority stock and transporting them to their countries of historical origin. See Alien; Coolie; Immigration; Population.

**Émigrés.** Term applied to Frenchmen who sought refuge in foreign countries during, and immediately after, the French Revolution. Most of these supporters of the old regime went to the Rhenish states of Germany, but everywhere actively advocated the restoration of the Bourbon dynasty. Their hopes of a speedy accomplishment of this object were shattered when the French Revolutionary armies defeated the Prussians and their allies at Valmy in 1792. After the final overthrow of Napoleon in 1815 the *émigrés* who were still alive or had not permanently settled abroad returned to France.

**Emilia.** Administrative division of N. Italy. It slopes from the Apennines to the river Po, and reaches the Adriatic. The name is derived from the Roman Via Aemilia, the great N. road which passed through the territory. The compartimento includes the provs. of Bologna, Ferrara, Forlì, Modena, Parma, Piacenza, Ravenna, and Reggio Emilia. Low-lying along the coast, it is elsewhere hilly, and is drained by tributaries of the Po. Area, 8,547 sq. m. Pop. 3,472,017.

**Eminescu, MIHAIL** (1849-89). Rumanian poet and editor. Born at Ipateshti in Moldavia, Dec. 26, 1849, he was educated at the universities of Vienna, Jena, and Berlin. In 1870 he contributed two memorable poems, *Venere si Madona*, and *Epigoni*, to the *Convorbizi Literare*, and in 1874 he was appointed school inspector and librarian in the university of Jassy. He died at Bukarest, June 15, 1889. He is regarded as a great lyric and satiric poet.

**Emin Pasha** (1840-92). German administrator. Born at Oppeln, Silesia, March 28, 1840, of

Jewish parents, his real name was Eduard Schnitzer. After studying medicine at Breslau and Berlin, he took up an appointment on the staff of Hakki Pasha, in Turkey. In Egypt, in 1878 he was appointed by Gordon governor-general of the equatorial province. When the Sudan was abandoned Emin was left in the heart of the country, whence he was rescued by Stanley in 1888. Returning, in the German service, he met his death at the hands of Manyama Arabs, Oct. 23, 1892. His success in abolishing the slave trade in the district under his control, his careful survey of over 4,000 miles of road, and his observations of the flora, fauna, and meteorology of the country gained him an enduring reputation.

**Emir.** Arabic word meaning commander, also spelt ameer (*q.v.*) or amir. It is used for chiefs and other rulers of certain Mahomedan peoples, the form emir being mainly confined to those in Africa.

**Emissivity.** The ratio of the heat energy emitted by a unit area of the surface of a body under given conditions to that emitted by the same area of a perfect black body under the same conditions. This is always exactly equal to the absorptive power. A surface coated with lamp-black will absorb practically all the heat energy falling upon it without reflection; its absorptive power is taken as unity. A surface heated uniformly and viewed through a small hole approximates to black body conditions, but if an article be taken out from the furnace into the open its surface will reflect and so it will radiate less energy than a black body at the same temperature. Emissivity thus depends on the kind of surface, the temperature, and the wave-length radiated. Optical and radiation pyrometers, used for measuring liquid steel and metal temperatures, are often calibrated for ideal black body conditions, so it is useful to know the emissivity of metals under various conditions.

**Emma** (1858-1934). Queen of the Netherlands. Daughter of the prince of Waldeck-Pyrmont, she was born Aug. 2, 1858, and in 1879 married William III, king of the Netherlands. Her daughter Wilhelmina (*q.v.*) became heiress to the throne on the death of William's sons by his first consort, and when William died in 1890, Emma was regent for eight years. Her many charitable acts endeared her to the poorer classes. She died March 20, 1934.

**Emma.** Novel by Jane Austen, written in 1815 and published the following year. It is one of the best of its author's works, full of character and humour in the presentation of the society of Highbury, a "large and populous village almost amounting to a town."

**Emmanuel College.** College in the university of Cambridge. It was founded in 1584 by Sir Walter Mildmay, chancellor of the exchequer, and is now governed under statutes dated 1925 by the master and fellows, 24 in number. Of the original buildings of the Dominican



Emmanuel College arms

house adapted to the use of the college at its foundation, the dining hall, fellows' combination room, old library, and parts of the master's lodge and the kitchen survive. Old Court dates from 1633; the chapel (bearing the date 1677) and picture gallery are the work of Wren; the rest of the buildings of Front Court which front St. Andrew's Street date from the 18th century. New Court dates from the early 19th century and North Court from 1914. The college was long a stronghold of Puritanism; among its famous men were Archbishop Sancroft and John Harvard, founder of the American college named after him. See Architecture illus. p. 572.

**Emmaus.** Ancient town of Palestine. It is now represented by the village of Amwas, on the road between Jaffa and Jerusalem, noted for a medicinal spring. It is not to be confused with the Emmaus of the N.T., near which Christ appeared to His disciples after the Resurrection; the site of this is unknown.

**Emmen.** Town of Holland, the biggest place in Drenthe. It is 29 m. S.S.E. of Groningen, just N.W. of the Berger Meer, and on the road from Groningen to Koevorden. The inhabitants are principally engaged in agriculture and stock rearing. Pop. 48,127.

**Emmenthal Cheese.** Swiss cheese, similar in appearance to Gruyère (*q.v.*), but half as large again, and with higher milk content. Though Swiss by origin, it is also made in mountainous districts of S.E. France and elsewhere.

**Emmerich.** Town of Germany in North Rhine-Westphalia. It stands on the right bank of the Rhine, 5 m. N.E. of Cleves, and not far from the frontiers of the Netherlands. The minster church was built in the 11th and 12th

centuries. Emmerich is an old place, having been a Roman settlement. In 1217 it was made a town; in 1407 it joined the Hanseatic League, and as part of the duchy of Cleves it passed into the possession of Brandenburg in 1609. Having been for a few years part of Berg, it was returned to Prussia in 1815. Heavily bombed and shelled by the Allies during the Second Great War, Emmerich was captured by the 1st Canadian army on March 29, 1945. It had been stubbornly defended by German parachute divisions and was completely destroyed.

**Emmet, ROBERT** (1778-1803). Irish nationalist. Youngest son of the physician to the viceroy, and



Robert Emmet, Irish nationalist After Petrie

brother of the United Irishman, Thomas Addis Emmet (1764-1827), he was born in Dublin and educated at Trinity College there. During 1800-02 he travelled on the

Continent, and was fired with the idea of securing French aid from Bonaparte in a rising against England. He collected arms at depots in Dublin and drew up a full plan of campaign for a rising on July 23, 1803. But treachery and faulty organization frustrated his plans, and Emmet fled into the Wicklow Mts. On Aug. 25 he was arrested near Harold's Cross, was found guilty of treason, and hanged, Sept. 20. The hold of Emmet's memory on popular imagination in Ireland was increased by the story of his love affair with the daughter of John Philpot Curran (*q.v.*), which inspired Moore's lyric, *She is far from the land where her young hero sleeps*. A study by R. Postgate appeared in 1932.

**Emmey, FRED** (1865-1917). A British comedian. Born in London, March 5, 1865, he appeared at Sadler's Wells in *The Ticket of Leave Man* in 1885. One of the most popular comedians of pantomime, he produced in 1912 the sketch by which he is best remembered, *A Sister to Assist 'Er—opening with the often-quoted line, "Is Mrs. May hin?"*—and, with Sydney Fairbrother, acted in it for three years. While rehearsing for a pantomime he slipped and received a fatal injury, from which he died, Jan. 7, 1917. His son Fred (b. 1900) also became a well-known comedian, distinguished for his great girth.



**Emotion** (Lat. *emovere*, to agitate). State of mind of an affective type. Emotions are chiefly composed of specific feeling-tones which differ greatly, e.g. triumph, rage, despair. They are pleasant or unpleasant, sometimes to a high degree. The strength, duration, and pleasantness or painfulness of emotions vary greatly from man to man; some enjoy violent anger, while others are exhausted by it or experience anxiety.

The original sources of emotions are situations which evoke instinctive action. Fear is caused by danger; sympathy by the sight of pain or grief. Emotions may subsequently be reawakened at a time when they bear little relation to the real needs of the individual; e.g., some feel "fighting-mad" when questioned by a policeman. Once roused, emotion is not easily modified by either reason or conscience, and when violent tends to control behaviour and affect beliefs. In many people emotion is easily switched from one object to another; thus arises the state known as "spoiling for a fight." For all these reasons emotion has been generally reviled by moralists. Emotions are unreliable guides to conduct and opinion, and one of the chief objects of moral education is to bring them under control. Yet they add colour to life; and the group known as "disinterested," including pity, and love of offspring, is indispensable to society.

Emotions have a marked effect upon many bodily functions. They cause the muscles of the face to assume expressions, through which we recognize the feelings of others. Attitudes, breathing, the action of the heart, the autonomous nervous system, and the ductless glands may all be changed. Consult Expression of the Emotions in Men and Animals, C. Darwin, 1872; Psychology of the Emotions, T. A. Ribot, 1897.

**Empedocles** (c. 495-435 B.C.). Greek philosopher of Agrigento in Sicily. He was the first to teach that all material substances are compounded from the four so-called elements, fire, air, earth, and water. These four elements are continually being separated and mingled by two moving forces, one Love or Friendship, the other Strife. He thus combined the Being of the Eleatics (q.v.) with the Becoming of Heraclitus (q.v.). According to legend, Empedocles threw himself into the burning crater of Etna in order that the completeness of his disappearance

might engender the belief that he had been translated alive to heaven. This is the subject of Matthew Arnold's *Empedocles on Etna* (1852). Pron. Em-ped'-o-kleez.

**Empedrado**. Town of Argentina, in Corrientes prov. It is on the Paraná, some 650 m. by rly. N. of Buenos Aires, also reached by steamer via Corrientes. It is the centre of a fruit-growing region. Pop. 24,300.

**Emperor** (Lat. *imperare*, to command). Title applied to sovereigns of the highest class. It was first used in this sense by Julius Caesar, who, among other titles, called himself *imperator*, a title hitherto borne by certain officials while in command of troops abroad. His nephew Augustus established the empire, and the title was borne by his successors both in Rome and in Constantinople; it was taken by Charlemagne when in 800 he founded the medieval empire. The rulers of the Holy Roman Empire bore it until the dissolution of that body in 1806, and in the 19th century it was assumed by several rulers who regarded themselves as more powerful than ordinary kings. Chief among these was Napoleon, who in 1804 assumed the title of emperor of the French, an example followed in 1852 by Napoleon III.

While the English translated the word *imperator* as emperor and the French as *empereur*, the Germans had rendered it as *Kaiser*, a tribute to Caesar, and this was the title taken by Francis II when he became emperor of Austria in 1804. In 1871 William I took the title of *Deutscher Kaiser*, but in both these cases the idea was well represented by the English word emperor. Less correctly, perhaps, the Russian *tsar* was freely translated emperor.

In the New World there were emperors of Brazil from 1821 to 1889, and in 1864 Maximilian of Austria took the title when he set up his empire in Mexico. The word is also used to translate the titles of rulers of Eastern countries; for instance, we speak sometimes of the emperor of Japan. In 1876, Queen Victoria became empress of India—the first British sovereign to bear the title *Kaiser-i-Hind*. The Greek word *basileus* is usually translated emperor. This was applied to certain rulers before the Christian era, and was taken by the emperors at Constantinople.

The original idea was that there could be only one emperor, whose authority extended throughout Christendom, and who was the overlord of kings. The modern

tendency is to use it for the ruler of a collection of countries, but, although we speak of the British empire, it has, strictly speaking, no emperor. See Sovereignty.

**Emperor Butterfly** OR PURPLE EMPEROR (*Apatura iris*). Large British butterfly, localised in oak-woods of S. and S.E. England. Usually it frequents the tops of trees, but descends to feed on carrion. The male is dark brown with a rich purple sheen; a white band and spots occur on the wings. The female is without the purple reflection. The caterpillar feeds on the sawfly. See Butterfly; also colour plate facing p. 1598.

**Emperor Concerto**. Title bestowed upon Beethoven's concerto in E flat for pianoforte and orchestra (op. 73). Composed in 1809, and dedicated to the archduke Rudolph, this was the fifth of Beethoven's piano concertos, and is remarkable for spaciousness and several innovations, e.g. the linking of the second and third movements; instead of the traditional tutti for orchestra at the beginning of the work, the piano-entry at the second bar; and dispensing with the customary cadenza (hitherto improvised by the performer), Beethoven writing his own. The concerto may be considered one of his most popular compositions.

**Emperor Moth** (*Saturnia pavonia*). Large, fairly common British moth; the male flies in

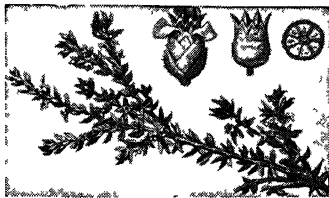


Emperor Moth,  
*Saturnia pavonia*

sunshine and the female is mostly a night-flier. The wings are mottled brown and tawny, with a conspicuous eye in the middle of each. The

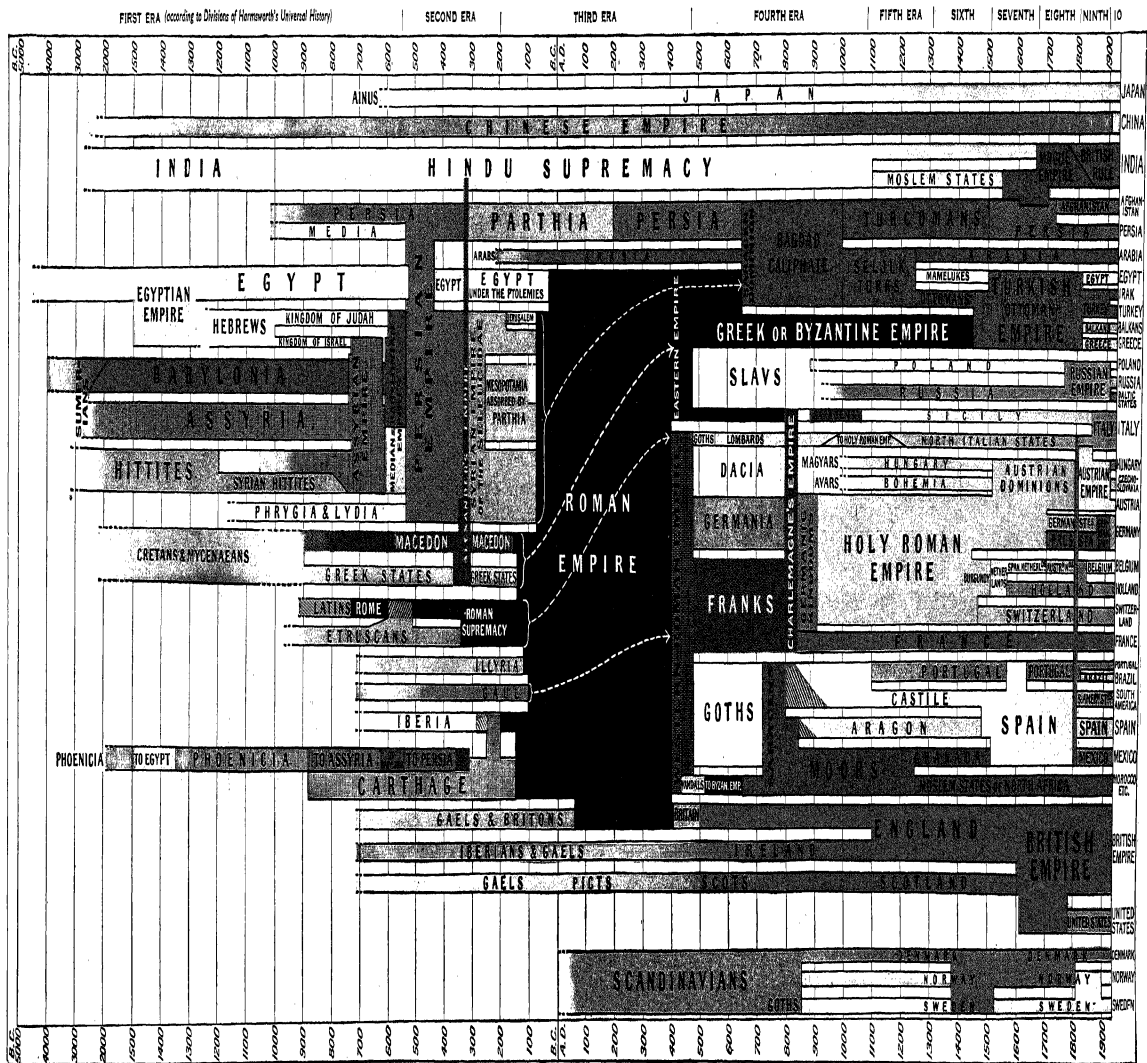
caterpillar feeds on the sawfly, bramble, heather, and other plants.

**Empetraceae** (Gr. *empetros*, growing on rocks). Family of evergreen heath-like shrubs. They are natives of the N. temperate and arctic zones, also of Chile and Tierra del Fuego. They have small,



Empetraceae. Leaves and fruit, also shown in section, of red crowberry





At some indefinite date in the neighborhood of 4000 B.C. there are indications that social life in Egypt and Mesopotamia was progressing towards the formation of organized states. History in both those regions opens shortly before 3000 B.C.; and it should here be noted that whereas this chart is divided into 100-year intervals back to 1500 B.C. (roughly the date of the first empire in a modern sense), the preceding intervals are compressed. Actually the period between 3000 and 1500 B.C. should occupy as much space as the subsequent period to the beginning of the Christian era.

During all these centuries there were experiments in imperial expansion. Thus in Mesopotamia Lagash-Elam, about 2700 B.C., established a hegemony, which was maintained for little more than a century by the kings of Akkad; the "empires" of the kings of Uruk (c. 2500) and of Hammurabi of Babylon (c. 1800) were equally transient. Sini and Nini were early brought under Egyptian rule.

In 1500 B.C. a ruling class of foreign invaders was expelled from Egypt, and the reborn carried Egyptian arms as far as the Danube; but it was only from 1450 onwards that the potential empire thus created was methodically conquered and organized by the genius of Thutmose III. From the considerable details of its administration that have come down to us we are justified in calling this the world's first genuine empire. In the meantime an experiment in federation under the leadership of the dominant tribe of Hatti, was being conducted in Asia Minor, and when, after about a hundred years, the empire of Thutmose crumbled away, the empire of Ashurnasirpal II (c. 880 B.C.) only towards the end was a system of Assyrian dependencies imposed. But new peoples were appearing; the Aryans moved into the Near East, and the Hittites, who had been united with Babylon and in fact wiped out the Assyrian name, there after dividing the empire with the Babylonians, while Egypt recovered independence.

In the West the Greeks were creeping round the Mediterranean. The Etruscans had appeared in northern Italy. Rome by tradition was founded in 753 B.C., Carthage in 950.

The Hebrew kingdom split into rival halves (c. 945 B.C.). Like Babylon, the Phoenician cities were intent on trade alone; movements of Greek-speaking peoples into the Aegean area blotted the Minoan power from memory; Egypt was gripped and imperiled. A Pargyan kingdom was consolidating in Asia Minor, but apart from this the only viable power on the stage was Assyria. By methods too ruthless to be called empire, Syria and Palestine were subdued, Babylon reduced to a vassal state, and finally Egypt conquered (525 B.C.), only towards the end was a system of Assyrian dependencies imposed. But new peoples were appearing; the Aryans moved into the Near East, and the Hittites, who had been united with Babylon and in fact wiped out the Assyrian name, there after dividing the empire with the Babylonians, while Egypt recovered independence.

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The Median kingdom had passed to the royal house of a cognate tribe, the Persians, and in 550 B.C. Cyrus the Great took over the Babylonian domains. Lydia, the successor of Persia in Asia Minor, fell to him, Egypt to his son Cambyses; Darius, son of an allied house, organized these vast territories into what again we are entitled to call an empire in the full sense. But attempts to extend it to Europe were defeated by the Greeks.

Wielded by the end, the first political union of Greek city states emerged as the Achaean Empire. But intestine rivalries wrecked it, and only was finally imposed by the half-Greek Philip of Macedon, whose son Alexander hung himself at the heart of Persia and won the greatest empire yet known; his death, however, was the signal for partition. Seleucos obtained the greatest portion, the East, later curtailed by the Parthians.

Rome was winning ascendancy in Italy, and by 100 B.C. had fought out her struggle with Hannibal (Carthage).

Rome's first task had been to make herself mistress of Italy; the three problems being her Latin kinsmen, the Etruscans north, and the Greek south. Next, her defeat of Carthage gave her Sicily and Spain, and in the meantime Illyria was gained; the latter, together with Macedonia backing for Hannibal, led to interference in the East. Macedonia was quashed in 168 B.C., "Asia" in 133.

After 100 B.C. Rome definitely stands forth as an imperial state; but in spite of the additions to her territories of the Seleucid domains (63), Gaul (50-51) and Egypt (30), the Republic was incapable of ruling the Empire. Augustus became Emperor in 27 B.C., and thereafter for 400 years almost all the known world was theoretically a single state from Atlantic to Japan.

Yet before the end of this period decay had set in. The Goths invaded Italy in A.D. 450; the Persian dynasty that succeeded the Parthians reconquered much of Mesopotamia; Dacia had fallen away by the end of the century; and between 314 and 335 the Christianized empire definitely split into Western and Eastern halves.

The Byzantine Empire was destined to survive until the capture of Constantinople by the Turks in 1453, sometimes with wide-dwelling dominions, sometimes with a meagre strip of territory, but always fulfilling the rôle of Europe's bulwark against the East. In the West everything went to pieces under the shock of barbarian invasions. Alaric captured Rome in 476; Vandals and Visigoths flooded into Spain; Vandals too Africa; Franks and Alamanni into Gaul; Goths and Lombards into Italy; Saxons into Britain. Finally the last vestige of empire was pronounced off in 476, only the Papacy carrying on the tradition of a world state. Charlemagne, king of the Franks, was crowned Emperor by the Pope, thus originating the idea of the Holy Roman Empire.

In the East, Islam started its career with Mahomet (570-634), and swept like a tide over Arabia, Syria, Persia, North Africa, and Spain. The Caliphs first ruled from Damascus, then (750) from Baghdad, with a rival caliphate (760) in Spain; where Arago and Castile maintained Christian independence in the north.

Imperialism during this period returned to the East. Afghan rulers established a Mahomedan dynasty at Delhi in India (1192); the Bagdad Caliphate disintegrated before Turkish invasions which consolidated into the Seljuk Empire; the Seljuks gave way to the Ottomans, who advanced their arms steadily into Europe.

In Europe the outstanding tendency was the growth of nationalism. England and France achieved nationhood previously, the first because of its isolation, the second because of the hostile attention of England. National spirit, in spite of political struggles against the Moors; Switzerland was independent from the Holy Roman Empire (1291); later oppression rallied Russia round the person of Moscow, Bohemia, Hungary, and Poland were consolidating since their adoption of Christianity in the tenth century. In Italy and Germany unity was disrupted perpetuated by the Holy Roman Empire; actually a patchwork of semi-independent cities and dukedoms, rent by the struggles between Pope and Emperor.

At this point history entered on a fresh phase with the discovery of the Cape Route by the Portuguese and the New World by the Spaniards. A Papal Bull granting dominion over the world outside Europe to these two powers—the West to Spain and the East to Portugal.

Spain made good much of her claim to the West, in spite of English and French colonization; whereas the Portuguese grant was modest, not only by England and Dutch, but by the existence of Turkish, Mogul, Japanese, and Chinese Empires. Meanwhile the Holy Roman Empire became centred on Austria, while Prussia achieved independence.

France and England took rank beside Spain as colonizing powers. During the conflict between them the loss of the United States seemed to put an end to the British Colonial Empire; but with Canada, Australia, and the Cape it was reborn, while the acquisition of India resulted in an Empire of a different sort. Russia had become an empire in the full sense. Napoleon nearly made a French Empire of Europe; his failure left the Spanish Empire in ruins (S. American States), but the unification of Germany a potentiality, realized by the Franco-Prussian War. Italy was united in 1870-71.

The Turkish Empire in Europe was disintegrating; and the First Great War broke it up, together with those of Germany, Russia, and Austria. The Second Great War destroyed the empires of Italy and Japan and brought new independence to some of the Eastern possessions of Britain, France, and the Netherlands.

EMPIRE: CHART SHOWING THE RISE AND FALL OF EMPIRES AND NATION STATES FROM THE DAWN OF HISTORY TO A.D. 1938





narrow, alternate leaves, and small, regular flowers, succeeded by fleshy berries. See Crowberry.

**Emphysema** (Gr., inflation). Condition in which the alveoli or air-cells of the lungs are over-distended with air and their walls atrophied. It is due mainly to long-continued increase of pressure of the air within the lungs and is most often seen in players on wind-instruments, glass-blowers, and sufferers from chronic bronchitis. Heredity plays some part.

Emphysema produces enlargement of the chest, which becomes barrel-shaped owing to arching of the ribs and sternum; the costal cartilages frequently become calcified, and movement of the ribs during respiration is much diminished, breathing being effected chiefly by means of the diaphragm muscle. The symptoms come on gradually, the earliest being some difficulty in breathing and feeling of "tightness" in the chest. The incomplete oxygenation of the blood may lead to cyanosis or blueness of the face. The disease may persist for many years, but gradually becomes worse. Death may occur from pneumonia, or the long-continued pressure in the lungs may lead to dilatation of the heart and dropsy. Medical treatment is not of much avail. Attempts have been made to increase the respiratory ventilation of the lungs by compressed air baths, etc.

Subcutaneous or surgical emphysema is a condition in which air finds its way into the tissues of the body, most often because of an injury which has resulted in an abnormal communication between an air-containing cavity and the subcutaneous tissue. In rupture of a lung, for instance, air may pass under the pleura or lining membrane, and spread up into the root of the neck and over the chest, producing swelling and a characteristic crepitation on pressure. Fracture of the frontal sinuses or air-cells may lead to subcutaneous emphysema in the forehead.

**Emphyteusis** (Gr.-Lat., implanting). Term of Roman law. It meant the right to enjoy the fruits of property belonging to another, on payment of a *pensio* or rent to the owner. It applied not only to land and houses, but to other property, e.g. slaves. The lessee might not allow the thing to deteriorate in value; and was bound to pay the rent whether the thing was beneficial to him or not.

**Empire.** Word derived from the Roman word *imperium* and meaning rule. It was used to describe the lands ruled by an emperor, the

most powerful of temporal rulers, who claimed to be superior to kings. The Roman empire founded by Augustus was succeeded by the medieval empire, known as the Holy Roman Empire, and by the Byzantium empire at Constantinople. In the 19th century there arose the Austrian, French, and German empires, and in the New World those of Brazil and Mexico.

The word is used also for large states of the E., and we speak of the Indian and Japanese empires. Moreover, the great states that existed before the Christian era, for convenience, called empires, and we are familiar with a cycle of empires—those of Assyria, Persia, Macedonia preceding that of Rome. At present the tendency is to describe a federation of states as an empire. The succession of the world's great empires is graphically depicted in the colour plate.

**Empire, HOLY ROMAN.** Medieval institution that lasted from 800 to 1806. The Holy Roman Empire was born on Christmas Day A.D. 800, when Charlemagne was crowned emperor by the pope. It expired in 1806, when Francis II dropped the ancient title and called himself emperor of Austria.

From A.D. 475 to A.D. 800 Constantinople had been the seat of the lineal successor of the Roman emperors, whose supremacy in the W. had been a mere figment, while the bishops of Rome had asserted a claim to be the spiritual head of Christendom in defiance of the E. authority whether temporal or ecclesiastical. Charlemagne made himself effective master of W. Europe, and the defender of the papacy against its enemies; and, as at Constantinople the empress Irene usurped the imperial throne, the pope crowned the Frankish king as the heir of the Caesars and Roman emperor. The actual title, the Holy Roman Empire, was adopted by Otto I in 962.

#### The Dominions of Charlemagne

The new Roman Empire, then, was at first co-extensive with the dominions of Charlemagne. The British Isles were outside it; so was Scandinavia; and so was the greater part of Spain. Roughly speaking, the line of the Elbe and the Adriatic Sea marked its E. boundary. Under Charlemagne's successors it was parted into three portions: the Latinised West, which retained the Frankish name, and was ultimately shaped into the kingdom of France; the eastern or definitely German section, which was gradually extended till it em-

braced all the German and some of the Slavonic peoples; and the central portion, lying about the rivers Rhine and Rhône, and including the greater part of Italy, of which, however, a S. remnant continued to be attached to the E. empire.

In spite of the division between the princes of the Carolingian house, one was recognized as enjoying a sort of primacy, and he bore the imperial title. But the Carolingian dynasty wore itself out by the beginning of the 10th century in the eastern and middle kingdoms; with the result that France became independent, while the supremacy in the empire passed to an elected German king, who himself only bore the imperial title when he had been crowned in Rome. Fragments of the middle kingdom were attached to France, but the greater part of it was included in the empire.

The first German king was Henry the Fowler; under his son Otto the Great, the Holy Roman Empire was reconstituted. There was no hereditary right of succession to the German kingdom; but the descendants of a powerful emperor usually retained the succession for generations. The ruler was therefore German king by a mixture of election and descent, for the elected king was more frequently than not a son or near relative of the late ruler.

#### Great Congeries of Principalities

A custom grew up by which, in order to avoid an electoral struggle on the death of an emperor, the future emperor was designated during the lifetime of the reigning one, and he bore the title of king of the Romans. The Empire in fact was a great *congeries* of principalities large and small, lay and ecclesiastical, of which one of the princes was the official head, by right of election and by sanction of the exercise of physical force superior to that of rivals or recalcitrants. From the middle of the 10th century to the middle of the 13th the emperor is in the first place a German prince having a limited authority over the rest of the German princes. In the second place he is the legal overlord also of Italy; the tradition and title of the Empire fosters in the emperors a desire to be Roman Caesars rather than German Kaisers. Thirdly, the emperors incarnate the idea, but not the fact, of Christendom as a unity.

But beside the Empire as unifying Christendom stood the papacy, actually dominating the entire ecclesiastical organization of Western Christendom, claiming for the



pope a spiritual supremacy overriding that of the emperor as the temporal head of Christendom; and overriding that of all temporal authorities whatever within their own dominions. Theoretically, the papacy did not claim to exercise control over things temporal. But practically the lay and ecclesiastical interpretations of the spiritual and temporal spheres of control differed and overlapped, so that there was an endless contest of authority. Thus we have the emperors in their fourth aspect, as the supreme representatives of secular authority in antagonism to ecclesiastical authority, in the contest between Church and State.

#### Guelfs and Ghibellines

The Saxon emperors, Henry and the three Ottos, finally rolled back or stemmed the advance of more barbarian races on the E., and penned the Magyars into Hungary. They dominated the papacy, nominating several of the popes. They were followed in the 11th century by the Franconian or Salian series, Conrad II and Henry III, IV, and V. The reign of Henry IV was marked by the struggle between the emperor and Pope Gregory VII, with whom begins the great period of papal domination. With Henry's death the rivalry opened in Germany between the Saxon house of the Welfs, or Guelfs, and the Swabian house of the Hohenstaufen.

The Swabians secured the imperial crown for some generations; hence the anti-imperialists in Italy adopted the name of Gueff as a party title, while the imperialists were called Ghibellines. The emperor Frederick Barbarossa (1152-90) was worsted in his struggle with the popes, while the cities of Lombardy succeeded, after a hard struggle, in securing their liberties; but in Germany he broke the power of the Guelfs and established his own supremacy, which was maintained by his successor, Henry VI. Henry, by his marriage, acquired the kingdom of Sicily; his son, Frederick II, the last Hohenstaufen emperor, succeeded to the empire after an interval of contest between other rivals. But he was in effect a Sicilian, not a German. His reign and the strife which preceded it destroyed what Frederick I had done towards the unification of Germany itself. Frederick II's death in 1250 was followed by the great interregnum during which no imperial authority was recognized. It was brought to an end by the election of a minor prince, Rudolph of Hapsburg, 1273, who laid the foundations of the greatness of that famous house.

The medieval European system was now breaking up. The papacy lost prestige by its transference from Rome to Avignon. The imperial crown passed from one house to another; from Hapsburg to Luxemburg, from Luxemburg to Bavaria, from Bavaria back to Luxemburg. It was at this time that a group of German princes were definitely established as the electors with whom alone lay the right of fixing the imperial succession. Sigismund, son of the emperor Charles IV, acquired the kingdom of Hungary by marriage, though it was not brought within the imperial bounds as was Bohemia. With Charles IV the efforts of German rulers to maintain their position in Italy came to an end.

The reign of Sigismund, during the early part of the 15th century, is chiefly notable for the reinstatement of the papacy after the great schism at the council of Constance (1414-18), and also for the establishment of the first Hohenzollern margrave of Brandenburg, the progenitor of the kings of Prussia.

On Sigismund's death, in 1437, Albert of Hapsburg became king and emperor; and from his day until 1806 a Hapsburg was, with one exception, at the head of the Holy Roman Empire.

#### Effect of the Thirty Years' War

In 1519 Charles V succeeded his grandfather, Maximilian I, as emperor. His reign is contemporaneous with the development of the Reformation. The hereditary Austrian and other German estates of the house of Hapsburg were transferred to Ferdinand, the brother of Charles, and he succeeded his brother as emperor in 1556. The pacification of Passau, procured mainly by his agency just before his accession, gave Germany peace for some 60 years by establishing a compromise between the Roman Catholic and Protestant princes. The attempt of Charles V to establish the personal supremacy of the emperor throughout Germany, failed; German princes, big and little, were nearly independent sovereigns.

In the 17th century Ferdinand II, in the Thirty Years' War, sought to bring the Protestant princes into subjection, while Wallenstein, careless of the religious question, sought by means of the war to make the emperor absolute monarch of Germany. Both attempts failed. After the Thirty Years' War (1618-48), the independence of the greater German princes was an established fact, while the still nominal imperial authority was little more than a

fiction. The struggle of the next 100 years between Bourbon and Hapsburg was not a struggle between the Empire and France, but between the Hapsburgs and France. Although the war of the Austrian succession included a contest for the succession to the imperial crown between the Bavarian claimant, Charles Albert, and Maria Theresa, the representative of the Hapsburgs, that was altogether a minor aspect of the struggle.

#### End of the Holy Roman Empire

Charles Albert was made emperor, but on his death the crown reverted to the Hapsburgs in the person of Francis of Lorraine, whose son Joseph II again aimed at establishing an imperial ascendancy by the consolidation of Hapsburg dominions within Germany. The attempt, however, collapsed when Frederick II of Prussia formed the *Furstenbund* (League of Princes) to maintain the constitutional rights of the German princes—which meant in effect their freedom from any recognizable imperial control.

In 1792 the French Republic went to war, not with the Empire, but with Austria. It was Austria, not the Empire, which was brought to submission by Bonaparte in 1797, again by Moreau at the battle of Hohenlinden in 1800, and by Napoleon at Austerlitz in 1805, when Napoleon had already proclaimed himself emperor. There was no longer any plausibility in maintaining the pretence that there was one imperial head of Christendom, so in 1806 the emperor Francis dropped the title and the Holy Roman Empire ended.

The history of the Holy Roman Empire down to the 16th century is, in respect of one part of it, identical with the history of Germany, and, in respect of another part, is intimately bound up with the histories of Italy and of the papacy. In the 16th century it is practically the history of Germany; the emperor is the German emperor with no pretensions to being the Roman emperor or the head of Christendom. From the middle of the 17th century the emperor is the Austrian emperor; the German or Holy Roman Empire exists only in name, with the survival of constitutional forms, until even the name disappears in 1806. See *Charlemagne*; *Electors*; *Golden Bull*; *Papacy*; consult also *The Holy Roman Empire*, J. Bryce, 1864 and later; *The Empire and the Papacy*, T. F. Tout, 1898; *The Medieval Empire*, H. A. L. Fisher, 1898; *The Close of the Middle Ages*, R. Lodge, 1901. A. D. INNES

**Empire Air Training Scheme.** Wartime scheme for training British and Empire airmen in the Dominions. Set up by an agreement signed at Ottawa, Dec. 17, 1939, between Great Britain, Canada, Australia, and New Zealand, this scheme provided for the training of airmen from these dominions and from Great Britain at schools established in New Zealand, Australia, and Canada, but principally in the last, because of its size and comparative proximity to Great Britain. It was devised to avoid the difficulties of air training in Great Britain, due in particular to that country's vulnerability to air attack. Most of the initial cost was borne by the dominions concerned, but the agreement provided for the reimbursement of their governments on the basis of the number of airmen trained. New Zealand gave elementary training to her own nationals, and Australia provided both elementary and advanced training; airmen from both received final flying training in Canada.

The four commands in Canada were centred at Montreal, Toronto, Winnipeg, and Regina. Each was sub-divided into elementary and service flying schools, observer, navigation, bombing, and gunnery schools, and engineering and technical training schools. Originally most of the instructors came from the U.K., but soon a central training school for instructors was opened at Trenton, Ont. By the end of 1940, 48 training schools in Canada were capable of producing 20,000 pilots and 30,000 other members of air crews per annum. Training absorbed 4,100 aircraft. These figures were later considerably exceeded. The first pilots to complete their training in Canada arrived in England in Dec., 1940.

Australia provided training for 10,000 pilots and 15,000 gunners, observers, and wireless operators over a period of three years, building 35 training schools for the purpose. The scheme was closed down in March, 1945.

**Empire Day.** British imperial celebration held annually on May 24, anniversary of Queen Victoria's birthday. The first celebration was in Canada in 1897, being organized at Hamilton, Ont., as a means of popularising Empire study among school children. The Dominion Teachers Association adopted the celebration, and thereafter Empire Day was held throughout Canada on May 23, May 24 being already a

school holiday. In 1902 the earl of Meath suggested an Empire Day celebration throughout the Empire and wrote to all prime ministers and governors within it outlining his plans. The first Empire-wide celebration was in 1904. The aim was to introduce a training that would produce patriotic citizens of the Empire, special prominence being given to saluting the flag. In 1921, at Lord Meath's request, the Royal Colonial Institute, now the Royal Empire Society (*q.v.*), undertook responsibility for the movement.

**Empire Free Trade.** Campaign for the adoption of free trade within the British Empire initiated by Lord Beaverbrook (*q.v.*) in 1929. Its object was the imposition by Great Britain of duties on meat, wheat, and other commodities from foreign countries, but not from the dominions, and the reciprocal admission by the dominions of British manufactured goods free of duty. Although the campaign earned some support from farming communities in the dominions, it was generally rejected by the dominion governments, whose policy was to encourage the development of local manufacturing industries.

**Empire Gallantry Medal.** British decoration, replaced by the George Cross in Sept., 1940. The



Empire Gallantry Medal

E.G.M. was awarded to 61 military personnel and 68 civilians between 1923 and 1940, those holders living when the change was made receiving the George Cross in its place. Posthumous awards of the E.G.M. made during the Second Great War were similarly replaced. The ribbon of the civil division was plain purple, that of the military division having a yellow vertical stripe down the centre. The medal was of silver, with "gallantry medal" inscribed on the reverse and "For God and the Empire" round the circumference.

**Empire Powder.** Smokeless sporting propellant manufactured by Nobel's Explosives Company. It is of the type designated 33-grain powder, the nomenclature signifying that this weight of propellant is the normal charge for a 12-bore gun, and comparable to the standard charge of 82 grains of black gunpowder. It

consists essentially of nitro-cellulose, containing about 12.5 p.c. of nitrogen, with small quantities of barium and potassium nitrate. Powders of this type are greatly valued for the low rate of recoil imparted to the gun. See Explosives; Smokeless Powder.

**Empire State Building.** Sky-scraper in New York City. Pending the completion of the Palace of the Soviets, Moscow, it was the tallest building in the world. Completed in 1931, the building,



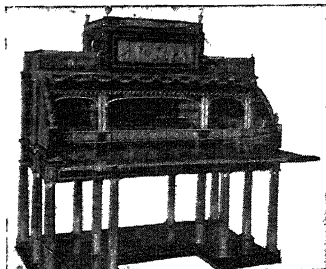
Empire State Building, New York. It is 1,248 ft. high

named after the "Empire State" (New York), rises from the junction of Fifth Avenue and W. 34th Street, is 1,248 ft. high, and is surmounted by a television transmission mast. There are 102 storeys above street level and two below. On the top floor there are an air-conditioned restaurant and an observation gallery. On July 28, 1945, a U.S. army bomber crashed in mist into the 79th storey of the building. In the crash and the fire that followed 13 people were killed and 26 injured.

**Empire Style.** In decoration and furniture, a development of the Directoire style, an outcome of the admiration felt by the leaders of the French Revolution for Greek and Roman culture. The Directoire style was severely classical in outline and decoration. A rectilinear outline was adopted, legs of tables and chairs were straight or tapered, round and fluted or reeded. Classic mouldings, capitals, and pediments, with a few republican symbols and animal masks, were the principal decorative commonplace.

With the Empire some of the solidity and simplicity of the Directoire disappeared. The furniture was rather light in

construction, and while the straight line was the rule in contour, curved lines were introduced in the decorative designs, such as wreaths of laurels, olive, and palm, dainty ribbon bows, and lyres. Imperial



Empire Style. Writing-desk showing decoration typical of this period

symbols, such as the eagle, bee, and crowned N, replaced the republican designs, while the sphinx was also used. Medallion portraits and figures (painted, enamelled, or porcelain plaques) were used, together with heavy gilded mountings of classic design. Much of the furniture was painted white, or gilded. White, gold, crimson, and dark blue were adopted for upholstery and hangings. The tripod and X legs are often seen. *See Furniture.*

**Empiricism** (Gr. *empeiria*, experience). In philosophy, the theory that regards experience as the only source of knowledge. It is closely akin to sensualism, the theory that all knowledge is only transformed sensation. The Stoics occupied a position midway between empiricism and idealism (*q.v.*), in that they considered the impressions made upon the soul through the sensations to be alone certain, but held that the truth or falsehood of these impressions depended upon their being characterised by an arresting power of conviction.

The founders of empiricism in modern philosophy are Hobbes, who maintained that all knowledge comes from the senses and that the activity of the mind merely consists in combinations of words, and Locke, according to whom the mind is a blank slate indebted for all its knowledge to the senses, which give it sensation and the perception of external objects, and to reflection which is exercised upon the operations of the mind. In more recent times its chief upholder is John Stuart Mill. *See Philosophy.*

**Employers' Liability.** Liability of an employer for injuries to his employees while acting in his employment. In the early

19th century, the increase in the number of factories, and the many accidents which took place then, would have imposed enormous liabilities on employers if they had been held responsible where the negligence of an employee caused injury to a fellow-employee. Accordingly the courts developed the doctrine of common employment under which an employer was not liable for the negligence of an employee when the person injured is a fellow-employee engaged in common employment with the employee who caused the injury. The Employers' Liability Act, 1880, provided that common employment should not be a defence to an employer where the employee injured was engaged in manual labour (other than domestic service) and the injury was due to (1) defects in machinery or plant; (2) negligence of superintendents (*e.g.* of a foreman); (3) improper bye-laws or instructions. On the railways, the doctrine was not a defence in the case of injuries caused by negligent management of signals, points, and trains.

The Workmen's Compensation Acts, the first of which was passed in 1897, provided that in the case of an employee engaged in manual labour or earning not more than a certain sum (£420 a year when the Acts were repealed in 1946) the employer should be liable to pay such employee compensation in the form of weekly payments for incapacity, and a lump sum, limited in amount, for death, for all injuries arising out of and in the course of his employment except injuries due to his own serious and wilful misconduct; and, if the injury caused death or permanent disablement, compensation was payable even if the injury was due to misconduct. Common employment was no defence to a claim under these Acts.

The employer might further be liable for injuries caused to an employee by some breach by the employer of some statutory duty—*e.g.* the duty to fence machinery under the Factory Acts, and to such a claim common employment was not a defence. Here again the claim was for a lump sum.

In 1946, the National Insurance (Industrial Injuries) Act, repealed the Workmen's Compensation Acts. For the resulting changes in the law relating to employers' liability, *see Insurance, National.*

**Employment Exchange.** Employment exchanges, totalling 540, with their subsidiaries, 483 em-

ployment offices, 181 branch employment offices, and 205 local agencies, form the local administrative units of the Ministry of Labour and National Service. Their work is co-ordinated by 11 regional controllers, and they deal directly with the public on matters not reserved for regional treatment. Of these employment exchanges, 113 are called allocation local offices, and to these are sent the registration forms of all men and women registering for military service. Action is taken, including medical examination, up to the point when the recruits are immediately available for posting for military duties. The actual call-up is done by the regional officer.

Within each employment exchange, and employment office, separate departments deal with men and women, and also with juveniles, where these are not dealt with by the local education authority.

The work of the employment exchanges consists chiefly of matters relating to the following: (a) Supply of labour and employment, including recruitment of trainees for government training centres; (b) The National Service Acts, including registration for national and military service; (c) Claims for unemployment benefit, applications for assistance, proof of unemployment, payments to refugees, issue of unemployment books and regulations; (d) Adjudication on claims to benefit; (e) Finance, including impressing for cash for benefit payments, issue of rly. warrants, payment of subsistence and lodging allowances, and compilation of man-power statistics.

Attached to most employment exchanges are local employment committees composed of representatives of employers and of workers. These act as advisory bodies to secure the benefits of local knowledge, and close co-operation between local exchanges, employers and applicants. At employment exchanges in large towns, juvenile advisory committees, composed of representatives of education authorities, employers, and youth organizations, advise on the first placings of children about to leave school. In many cases, special meetings of children are arranged, and advice and information are given by competent speakers. The secretary of the juvenile advisory committee arranges to be represented at the after care meetings held at each

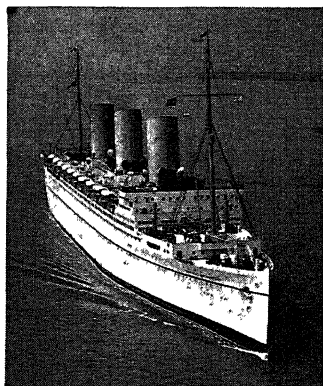
school to advise scholars seeking employment.

Historically, employment exchanges are developments of the labour exchanges organized by local authorities under the Workmen's Unemployment Act, 1905, as a clearing house for vacancies and applicants. National labour exchanges were set up by the Labour Exchanges Act of 1909 and placed under the direction of the Board of Trade. These undertook the administration of the unemployment section of the National Insurance Act, 1911. During the First Great War the number of insured persons rapidly rose, and a large surplus accumulated in the unemployment fund. The growing importance of the work of the employment exchanges led to the establishment of a ministry of Labour in 1916. After the First Great War, the exchanges experienced their most difficult period. Administering in trying circumstances a succession of acts designed to alleviate increasing unemployment, they did much constructive work in promoting transfers, and organizing and conducting training schemes to enable workers to fit in with the new conditions. Just before the Second Great War they became the national service offices, issued the service handbook to all citizens, and the schedule of reserved occupations. The employment exchanges became the integral machinery for the mobilization of the nation's man and woman power. In normal times, employment exchanges play an increasing part in local life. Their activities touch the lives of almost everybody above school-leaving age. They help to divert labour towards industries where it is needed, and on their returns is based that necessary adjunct to the financial budget, a manpower budget.

**Empoli.** Old town of Italy in the prov. of Florence. It stands on the Arno, 20 m. by rly. W.S.W. of Florence, in a fertile district. The collegiate church, founded 1093, was destroyed in the Second Great War; its pictures are mostly housed in a neighbouring gallery. The church of S. Agostino was seriously damaged. Jacopo Chimenti, the painter, was a native. Empoli has manufactures of cotton, leather, glass, and art pottery. Indian troops of the British 8th army entered Empoli on Aug. 5, 1944, the Germans subsequently withdrawing across the Arno. Pop. 21,250.

**Empress.** Feminine of emperor. It is a corruption of the Latin *imperatrix* and is applied by courtesy to the wives of emperors, as well as to the few women who have ruled over an empire. Maria Theresa was an empress (Ger. *Kaiserin*), and Queen Victoria was empress of India. The women rulers of the Byzantine empire, Irene, for instance, and Catherine and Elizabeth of Russia, are also known in English as empresses. See Emperor; Sovereignty.

**Empress of Britain.** British liner of 42,348 tons completed in 1931 as flagship of the C.P.R.



Empress of Britain. C.P.R. liner sunk by the Germans in 1940

fleet. In 1939 she brought King George VI and Queen Elizabeth back to England after their tour in Canada and the U.S.A. On Oct. 25, 1940, the Empress of Britain was attacked by German bombers when 150 m. off the Irish coast. She was heavily damaged and taken in tow by Admiralty tugs, but on the night of Oct. 27 was sunk by a German submarine. Among the survivors was Gen. Legentilhomme (*q.v.*).

**Empress of Ireland.** Passenger steamer belonging to the C.P.R. On May 29, 1914, outward bound from Quebec to Liverpool with 1,367 people on board, the Empress of Ireland was rammed by the Norwegian collier, Storstad, in the St. Lawrence river during a fog. The liner sank in ten minutes, and 934 persons went down in her, including the actor Laurence Irving.

**Empson, SIR RICHARD** (d. 1510). English lawyer. Born at Towcester, Northants, he became M.P. for that county, and speaker of the house in 1491, and, knighted in 1504, was made chancellor of the duchy of Lancaster. A favourite of Henry VII, he col-

laborated with Edmund Dudley in that king's obnoxious fiscal policy, and became universally unpopular for his harshness. After Henry VIII's accession he was tried on a charge of constructive treason, attainted by parliament, Jan. 21, 1510, and beheaded with Dudley on Tower Hill, Aug. 17, 1510.

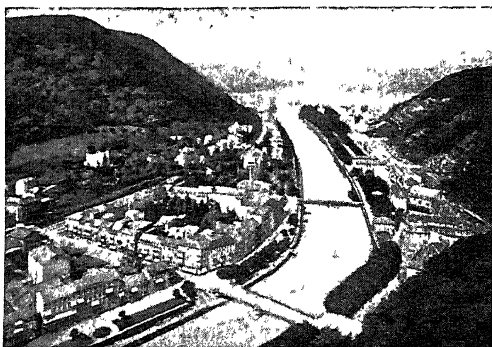
**Empyema** (Gr., suppuratio). Collection of pus in the pleural cavity—that is, between the layers of membrane lining the chest wall and the lung. The condition may be due to infection from within, following simple pleurisy or septic pneumonia, or sometimes tuberculous broncho-pneumonia; less frequently to infections from without, as a result of fracture of a rib or a penetrating wound of the chest. The onset may be sudden, with pain in the chest, sweating and rise of temperature, but when, as usually, the condition develops in the course of simple pleurisy or a morbid condition of the lung, there is no marked line of separation in the symptoms.

Empyema is a serious condition, and if left untreated is likely to prove fatal. In mild cases it may be sufficient to draw off the pus by aspiration, but generally it is necessary to secure thorough drainage of the pleural cavity by making an opening between the ribs or removing a portion of a rib so that a large drainage tube can be inserted. This causes collapse of the lung on the affected side, but if the operation has been performed early there is a good prospect of the lung re-expanding after the discharge has ceased and the wound has healed.

**Ems.** River of Germany. It rises in Westphalia, in the Teutoburger Wald, and flows mainly in a N. direction through Westphalia and Hanover to the Dollart, an opening of the North Sea. Its length is about 210 m., and its chief tributaries are the Aa, Haase, Hessel, and Leda. It has been canalised as part of the system of German waterways. Emden is at its mouth. See Dortmund-Ems Canal.

**Ems.** German town and spa, on the river Lahn, 8 m. from its confluence with the Rhine S. of Coblenz. It has powerful and famous alkaline and ferruginous waters, used for drinking and bathing cures at least since the 14th century; the waters have a natural temperature of 85°–120°F., and were bottled and dispatched to many countries. A pleasant town of some 7,500 inhabitants,

Ems is situated between wooded hills offering attractive walks; it has a kursaal, theatre, many hotels and nursing homes, etc., and visitors staying for cure of cararrh, asthma, or diabetes between the two Great Wars averaged 10,000 a year. Ems passed from Hesse-Nassau to Prussia in 1866.



Ems, Germany. Town and bathing-place standing in the valley of the river Lahn

In 1786, by the Punctuation of Ems, the German bishops made an unavailing attempt to throw off their allegiance to the pope; and in 1870 the Ems Telegram (*v.i.*) provoked the Franco-Prussian War.

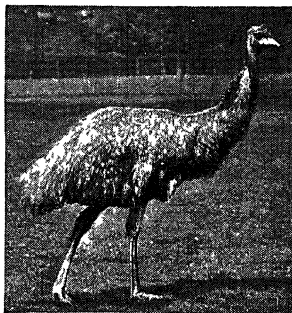
**Ems Telegram.** Message published by Bismarck in 1870 which was the immediate cause of the Franco-Prussian War. France had just succeeded in obtaining the withdrawal of Leopold of Hohenzollern as a candidate for the throne of Spain, but put forward a further demand. On July 13, 1870, Benedetti, the French ambassador, interviewed King William I, who was staying at Ems, and requested a promise that he would not allow the candidature to be renewed. The king refused, and later in the day declined to reopen the discussion. To Bismarck at Berlin he sent an account of the proceedings, and this was the Ems telegram.

Bismarck thereupon published the telegram with certain alterations, especially in that part of the message in which the king informed Benedetti that he could not discuss the matter further. These made it appear that instead of this being merely a courteous refusal to reopen the matter, it was a dismissal of the ambassador from his presence. Thus it was treated by France as a *casus belli*. The vital sentence was "His majesty refused to receive the French ambassador, sending word that he had nothing more to communicate."

**Emsworth.** Seaport of Hampshire, England. It stands at the mouth of the Ems, a small stream. It is 9 m. N.E. of Portsmouth, and has a railway station. The port has a coasting trade and oyster beds. Pop. 3,500.

**Emu** (Port., *ema*, ostrich) (*Dromaeus novae hollandiae*). Large bird belonging to the division Ratiatae. It is found only in Australia

and certain neighbouring islands. The second largest bird now living, it is exceeded in size only by the ostrich, which it somewhat resembles in general build. But the wings of the emu are more rudimentary, and the bird depends entirely on its swiftness as a runner to escape its foes. The slender feathers are brown, mottled with grey, but the younger birds bear longitudinal stripes of lighter colour. Emus are rare except in



Emu. Second largest bird known, it is peculiar to Australia  
Gambier Bolton, F.Z.S.

the wilder parts of the country, where they live in small flocks and feed chiefly upon small fruits. Although not web-footed, they swim well, and take to the water readily. They are hunted with dogs, and when brought to bay can deliver serious kicks. These birds are easily domesticated, and breed readily in captivity. The male, smaller than the female, incubates the eggs, which are green.

**Emulsin** (Lat. *emulsus*, milked out) OR SYNAPTASE. Name given to enzymes (*q.v.*) which hydrolyse glycosides of the beta series. Emulsin occurs in plants, *e.g.* fruit kernels, leaves, mould fungi, and bacteria. Its action on the amygdalin present in bitter almonds produces essential oil of

almonds in the process of manufacturing the expressed oil. Emulsin may be made from an aqueous extract of almonds by precipitation with alcohol and subsequent purification.

**Emulsion.** Substance formed when droplets of one liquid are dispersed in another liquid, each liquid being insoluble in the other. The addition of a third substance, called the emulsifying agent, is generally necessary to prevent the droplets from coalescing. The emulsifying properties of yolk of egg and gum arabic have probably been known to mankind for centuries. The number of emulsifying agents used in industry is being added to continually. They are used in agricultural sprays, in the textile and leather industries, in cleaners, soaps, cosmetics, and pharmaceutical preparations, foods, paints, and polishes.

A photographic emulsion is the term given to the light-sensitive layer either in the solid form on its support of glass, film, or paper, or in the liquid form before application thereto. It is more correctly described as a photographic suspension, being the dispersion of a solid in a liquid phase. The emulsifying agent is usually gelatine or collodion (*q.v.*). The essential constituent is one of the silver halides, chloride, bromide, or iodide, or a combination of these, precipitated in the dispersion medium. Sensitiveness to differing regions of the spectrum is attained by treatment of the emulsion with various dyes. After "ripening" and "digestion," two processes which affect contrast and other characteristics, the emulsion is cooled and set, being further modified before final coating. See Photography.

**Enabling Act.** Popular name for the National Assembly of the Church of England (Powers) Act, which became law in 1919. It was introduced by the archbishop of Canterbury, the object being to set up for the Church of England a national assembly with considerable powers for the government of the Church (see Church Assembly). The Act set up a roll of electors in each parish. (See Electoral Roll.) The various diocesan conferences elect the members of the house of laity. See Convocation.

**Enamel.** Transparent or opaque glassy substance applied to metal or other surfaces in the form of a paste and then fired to fix it. The material—ground very fine, mixed with gum, water, or oil of spike to

render it adhesive, and reduced to a pasty consistency—is brushed on to the object, which, when duly decorated, is placed in a furnace. In pots, pans, and culinary utensils an internal lining of enamel protects the iron body from oxidation when exposed to heat and wet or from corrosion by acids. The metal, after having been annealed to bear the heat, is dipped into the glaze and fired in a furnace at 1,500° F.

In the fine arts enamel is principally used in connexion with pottery and porcelain wares, jewelry, watches, snuff-boxes, plaques, and articles for the toilet table. The enamel may be applied by the enclosed method of *cloisonnée* (*q.v.*), the engraved or incised method or *champlevé*, and the surface method, in which the whole surface is covered with enamel on which the design is delicately painted and fired. Coloured enamels were used by the Egyptians, the Greeks, and Romans, but the art was brought to a high state of perfection under the Byzantine emperors. A special style was developed among the Orientals, while a kindred art of polychoured enamelling was carried out extensively in N. Europe. Of the surface style the enamels for which Battersea was noted in the 18th century are an example, while in Limoges enamel, which was a variety of surface work, painting was carried to rare perfection by the practitioners of the 16th cent. Copper was the metal most employed for this purpose, but gold and silver were sometimes used.

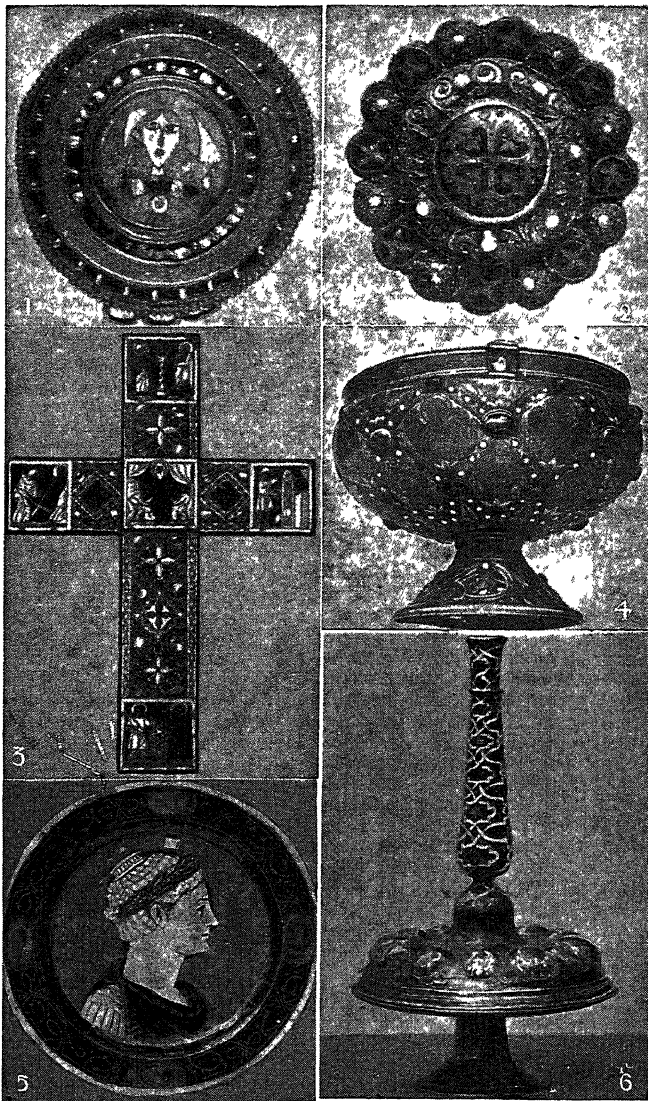
**Enare.** Lake in Finland, in the N. of the department of Oulu. It is fed by a number of rivers, and discharges its waters through the Pasvik into the Varanger Fiord in the Arctic Ocean. Its area is 550 sq. m. *Pron.* Enah-re.

**Enarea.** Plateau region of Abyssinia, S.W. of Shoa. It has hills attaining an elevation of 8,000 ft. above sea level, upon the slopes of which coffee grows in abundance. The people are an off-shoot of the Gallas. The chief town is Saka, near the Gibbe river.

**Enargite.** An orthorhombic copper mineral, chemically copper arsenic sulphide,  $\text{Cu}_3\text{AsS}_4$ , with minor amounts of antimony and iron. It occurs as greyish black tabular or prismatic crystals with a perfect cleavage; also massive or granular. Enargite is found typically in vein and replacement deposits formed at moderate temperatures with other copper minerals; e.g. at Butte, Montana.

**Encaenia** (Gr. *en*, in; *kainos*, new). Feast of dedication or renewing. It is used especially for an anniversary of the dedication of a church or temple. Among the Jews it is applied particularly to the anniversary festival of the dedication of the temple at Jerusalem. At Oxford university, Commemoration, the festival at the end of the academic year, when founders and benefactors are commemorated, is also known as Encaenia.

**Encalada**, MANUEL BLANCO (1790–1876). Chilean soldier and diplomatist. He was born at Buenos Aires, and having been educated at Madrid and the naval academy at Leon, returned to S. America, where he joined the revolutionary party. He was with Cochrane (10th earl of Dundonald, *q.v.*) in his Pacific campaign as commander of the Chilean navy. In 1853 Encalada was appointed Chilean minister to France. He died Sept. 5, 1876.



**Enamel.** 1. Gold brooch with bust in cloisonné enamel, Italian, c. 7th century. 2. Gold brooch of German make with Byzantine cloisonné enamels, 11th cent. 3. Enamelled cross, attributed to Godefroid de Clare of Huy, late 12th cent. 4. Ciborium of Limoges work, 13th cent. 5. Plate in brilliant colours of Limoges work, c. 1530. 6. Pillar candlestick, Limoges, c. 1590



**Encarnacion.** City of Paraguay. The capital of Itapua dept., it stands on the Paraná, 230 m. S.E. of Asunción, with which there is river connexion. It is the terminus of the Paraguay Central rly. and connected by ferry with Posadas in Argentina. The centre of the cattle industry, it produces hides, also yerba maté and tobacco, and has cotton gins, sawmills, and flour mills. Pop. 16,078.

**Encaustic** (Gr. *enkaustikos*, burnt in). Method of painting with colours and wax, said to have been invented by Polygnotus (5th century B.C.) and much practised by the ancient Egyptians and Greeks. Their technique is not definitely known, but it is surmised that coloured powder was mixed with white wax and kneaded into small cakes. When required metal disks with cuplike indentations were heated and a cake was laid on the palette, a different colour in each depression, and gradually melted. The process was rapid, for the wax, laid on with a brush, cooled quickly and the work had then to be touched again with moderately hot irons, which fused the tints.

**Encephalitis.** Inflammation of the brain. This may occur as a primary condition due to an attack by a virus as in encephalitis lethargica or sleepy sickness; or it may be the result of injury, spreading abscess, or syphilis. Headache, coma, irritability, convulsions, and vomiting are common to all forms. Paralysis and over-irritability of muscle groups localise for the physician the severity and site of the lesion.

Encephalitis lethargica is an infection of the nervous system by a virus which is believed to travel to the brain via the nerve fibres themselves. Thereupon the virus, unable to get out, is caged within the nervous system, where it may survive for long periods, giving rise to lapses of nervous balance. The onset has much in common with influenza. The disease never leaves the patient undamaged, and often there may be serious alteration in personality and deterioration of moral fibre.

Cerebral abscess is never a primary condition, but travels from some infective focus, frequently in the ear or throat, or from suppuration in the chest or distant bones. Injuries to the skull cause a percentage of these cases. Treatment is essentially surgical, but the sulphur group of drugs and penicillin are valuable wea-

pons against the staphylococci and streptococci, the main causative organisms.

**Encina** OR **ENZINA**, **JUAN DE LA** (c. 1469 – c. 1534). Spanish poet and dramatist. He was born perhaps at the village the name of which he bore, and educated at Salamanca university. His first plays were acted in 1492. When his Representaciones were performed before Ferdinand and Isabella and the court, he was secretary to the duke of Alba. In 1496 his plays, partly autos (q.v.) and partly secular, were published, and shortly after he went to Rome, where he became a priest and received an appointment in the pope's chapel. In 1519 he made a pilgrimage to Jerusalem, and published an account of it in 1521. He was made prior of Leon, and died at Salamanca. Founder of the secular drama, his contemporary popularity was such that six editions of his plays were produced between 1496 and 1516.

**Encirclement.** Term applied by German politicians to describe any alliance that tended to curb German aggressive expansion. The chancellor von Bülow was the first to raise the cry of encirclement, when in 1906 he promoted bills for the expansion of the German navy. Great Britain had striven to come to an agreement with Germany, and had turned to France and Russia only after Germany had repulsed all overtures and embarked upon a patently anti-British policy. The ties of the "encircling" alliance were really so loose that France and Russia were not sure whether Great Britain would support them at the outbreak of war. Hitler professed to see a renewed threat of encirclement in the British attempts to form an anti-aggression front in March, 1939, after the annexation of Czecho-Slovakia by Germany.

**Encke**, **JOHANN FRANZ** (1791–1865). German astronomer. Born in Hamburg, Sept. 23, 1791, he studied in Göttingen, and in 1822 became director of the Seeberg Observatory near Gotha. In 1825 he succeeded to the post of astronomer of the academy of science, and director of the Berlin Observatory, then in course of erection. In 1863 he retired into private life at Spandau, where he died, Aug. 26, 1865. Encke worked out, from the observations of the transits of Venus of 1761 and 1769, the first authentic value of the sun's parallax; determined the path of Pons' Comet; and

undertook the observation of another comet, since known by his name (v.i.).

**Encke's Comet.** On Nov. 26, 1818, Pons of Marseilles discovered an inconspicuous comet whose elements Encke calculated with the unexpected result of finding that it revolved about the sun in a period of  $3\frac{1}{2}$  years (1,208 days). It has been observed at over 40 returns since. The period is considerably shorter than that of any other known comet. Its outward journey takes it near the planet Jupiter, to whose family it belongs. Its unique point of interest is the steady shortening of its period, by about  $2\frac{1}{2}$  days in a century, which cannot be explained by the gravitational pull of any known body. It seems likely that near the sun it encounters a resisting medium which causes it to fall in towards the sun and thus to accelerate.

**Enclave** (Lat. *in*, in; *clavis*, key). Detached part of a country or state entirely surrounded by the territories of another. The name is used by the country owning the surrounding land, the separated tract being an exclave from the point of view of the country possessing it.

**Enclosures.** Word used specially for common land which is enclosed, i.e. converted by private persons to their own use. This practice began in England with the decay of the manorial system, when the lords of the manor frequently enclosed common land. From time to time there was an outcry against it, notably in Tudor times. Latimer referred scathingly to enclosures, while Somerset, acting for Edward VI, appointed a commission to inquire into the matter. The law about it during the Middle Ages was contained in the statute of Merton of 1235 which allowed the lords to enclose land, provided that they left sufficient common unenclosed to meet the rights of the commoners.

After about 1700, enclosures were made by special Acts of Parliament. The Acts distributed the land between the lord of the manor and the various persons who had rights in it. Between 1700 and 1845 there were about 4,000 of these Acts, under which about 5,000,000 acres were enclosed. In 1801 an Act ruled that the consent of three-fourths of the freeholders and copyholders of the manor was necessary before land could be enclosed. In 1845 the matter was put in the hands of commissioners whose business was to

examine suggested enclosures, and see that some part of the land was set aside for public purposes. About then the movement for the preservation of common land began. Suggested enclosures, the case of Epping Forest being the standing example, were prevented, and in 1876 an Act virtually put an end to the practice. In Scotland and Ireland the matter never attained the importance it did in England. See Commons; Manor.

**Encounter Bay.** Inlet of the coast of S. Australia, between Port Elliot on the N. and Jaffa Cape on the S. It is 90 m. across its entrance and is the last important indentation of the coast before the state of Victoria. Off the N.W. corner of the bay lies Kangaroo Island.

**Encratites** (Gr. *enkrateis*, self-controlling). Ascetic sect of the 2nd century. They taught the essential evil of matter and abstained from flesh, wine, property, and marriage. Encratite doctrines seem to have been first taught systematically by Saturninus early in the 2nd century, although the principle was combated already in I Timothy 4, and the sect became organized under the leadership of Tatian. Encratism spread widely in Asia Minor, and the apocryphal Gospel according to the Egyptians furnished some of its arguments. In the 4th century they became merged with Gnosticism and Montanism.

**Encrinites.** Popular name for the crinoidæ (*q.v.*).

**Encyclical** (Gr. *enkyklios*, circular). Eccles. term for a letter from a Church authority, not addressed to any particular individual or community. Thus the General Epistles of S. Peter and the pronouncements of councils which were sent forth to the Church at large were thus named. The term is now used for a communication of the Pope to the bishops generally on some ecclesiastical topic. It differs from a bull, since it does not deal with any special case, but indicates general principles to guide the bishops in dealing with important questions.

**Encyclopædia.** Word derived from the Greek (*enkyklios*, circular, complete; *paideia*, education). The spelling of the word without the diphthong is justified on grounds of scholarship, for the very first time the Greek form was rendered into English, *via* the Latin, the writer, Sir Thomas Elyot, in *The Governour*, 1538, spelt it *encyclopedie*. It has been approved by Dr. Johnson, Webster and other lexicographers. The word may be translated as the whole circle of knowledge. For long it expressed this idea to scholars trained in the tra-

ditions of Rome, but it was not used as the title of a book until the 16th century, some years after the invention of printing. Before then, however, many works had been written which may be fairly described as encyclopædias, for their authors claimed to give information about all the interests of the human mind.

The first of these known encyclopædias is the *Historia Naturalis* of the elder Pliny; and the Middle Ages saw the production of Etymologies by Isidore, bishop of Seville (d. 636); and of *The Origin of Sciences* by the Arab scholar, Alfārabi (d. 950); as well as of a number of less notable ones. The most outstanding encyclopædia, however, written in Latin, was by Vincent of Beauvais (d. c. 1264). It was called *Speculum Majus* (Greater Mirror), and is divided into four main parts, dealing with science, theology, history, and morality (the last section being possibly wrongly ascribed to Vincent).

The material in these encyclopædias was arranged according to subjects, not in alphabetical order, but some time after the invention of printing the advantages of the latter arrangement became manifest. About the same time, too, it was realized that if encyclopædias were to be read they must be written, not in Latin, but in a popular language. However, before these important changes came about J. H. Alsted, in 1620, had produced a Latin work of the old kind, notable because it was the first of any size to be called an encyclopædia. The two innovations just mentioned were both introduced to the world by a Frenchman, Louis Moréri. His *Grand Dictionnaire*, 1674, was an encyclopædia in the modern sense, although, like his immediate successors, he preferred to call it a dictionary. It was very popular, and so was that of Pierre Bayle, which in 1697 appeared as an improvement on Moréri.

The first encyclopædia written in English was the *Lexicon Technicum*, 1704, of the Rev. John Harris, though as early as 1398 John Trevisa had translated a Latin work of this kind into English. Harris was followed by a much greater name in the history of encyclopædias, Ephraim Chambers, the real originator of the modern work. In 1728 Chambers produced his *Cyclopædia: or Universal Dictionary of Arts and Sciences*. A little earlier an Italian, M. V. Coronelli, had begun a more ambitious work, but it was never completed. In 1732-54 was published

Zedler's *Great Universal Lexicon*, a German work ed. by J. A. Frankenstein and others, but usually known by its publisher's name.

The effects of Chambers's work were felt in France. It was translated into French, and on it was founded the most celebrated of all encyclopædias, the *Encyclopédie*, which, edited by Diderot and D'Alembert, counted Voltaire and Rousseau among its contributors. Neither Chambers's nor the *Encyclopédie* included biographies, although Moréri and other earlier writers had done so.

The British counterpart of the *Encyclopédie* was the *Encyclopædia Britannica*. The first edition of this, ed. W. Smellie, appeared in three volumes in 1771. From it biography and history were excluded, but both appeared in the second and subsequent editions. Throughout the 19th century further editions appeared, to which leading scholars contributed. The 11th edition, by the Cambridge University Press, was published 1910-11; the 14th edition (New York) began to appear in 1929.

Meanwhile a host of other encyclopædias appeared in Great Britain and abroad. In France there was *La Grande Encyclopédie*, also that of Larousse; in Germany the *Konversations-Lexicon* of Brockhaus and that of Meyer; in the U.S.A., the *New International*; and many others. Among the English works of the kind were *The Penny Cyclopædia* of Charles Knight, 1833-43, and the one issued by the Edinburgh firm of Chambers in 1859-68, and several times revised.

At the end of the century a gigantic and novel advertising campaign carried on by *The Times* in order to sell the ninth and tenth editions of the *Britannica* had an enormous effect in popularising the work and in stimulating a demand for books of this kind. This was seen in 1905-06, when *The Amalgamated Press* put upon the market *The Harmsworth Encyclopædia*. Sold in fortnightly parts, this was an unprecedented success. Recent years have witnessed the output of a host of encyclopædias devoted to a single branch of human knowledge—theology, sport, agriculture, education, for examples; but none has ever attained such worldwide circulation as *THE UNIVERSAL*, first serially issued 1920-22, and now after several revisions appearing in this new form.

**Encyclopédistes.** Name given to the contributors to the *Encyclopédie* edited by D'Alembert and Diderot. They were writers of high repute in literature and philosophy,

including Rousseau, Grimm, Voltaire, Baron d'Holbach, and the two editors. Several of the encyclopédistes held advanced views on political and social matters, besides being sceptics with regard to Christianity, and this was reflected in much that they wrote. The influence thus exerted by the *Encyclopédie* upon the minds of the educated classes helped to ripen French public opinion in favour of the Revolution.

**Endecott, JOHN** (1589–1665). English colonial governor. Born at Dorchester, Dorset, he sailed



*John Endecott*

to N. America in 1628 and became manager of the Naumkeag (now Salem) plantation. Being superseded by John Winthrop, he employed himself in fighting the Indians. In

1641 he was made deputy-governor of Massachusetts and three years later became governor, a post he held with intervals until his death at Boston, March 15, 1665.

**Endemic** (Gr. *endēmos*, native). Biological term applied to an organism which is found only in a particular region. It is also applied to diseases which are always more or less present in certain localities, as distinguished from epidemic diseases which may be widely prevalent at one time and completely absent at another. See Disease; Public Health.

**Enderbury.** For this Pacific island, see Canton and Enderbury.

**Enderby Land.** Desolate tract of Antarctica. It extends S. from the Antarctic Circle, in lat. 50°–55° E. It was discovered by John Biscoe in 1831, who named it after his employers, Enderby Brothers.

**Endive** (Lat. *intibius*). Plant of the same genus as chicory (*q.v.*).

**Endocardium** (Gr. *endon*, within; *kardia*, heart). Smooth membrane which lines the interior of the chambers of the heart. Inflammation of this membrane is termed endocarditis. See Heart; Rheumatic Fever.

**Endocrinology** (Gr. *endon*, within; *krinein*, to sift; *logos*, science). The study of the glands of internal secretion. These manufacture hormones which pass into the circulation, pervade the organism and affect various cells and tissues. The endocrine system is one of the body's two main regulating mechanisms, the other

being the nervous system. It is an example of humoral and chemical control.

Ductless glands, as they have been called, must be differentiated from other glands, particularly those which pass an external secretion down a duct to the site of its activity, *e.g.* the salivary glands; and also from the lymphatic glands which are an integral part of the lymph system and defence mechanism of the body.

Hormones (Gr. *horman*, to rouse) are physiologically active chemical substances. In most instances the action of the hormone is excitatory. An endocrine gland is usually both factory and warehouse for its hormone, as the latter is not stored elsewhere in the body for any length of time. The functions of these glands have been studied by their removal in animals, by the administration of gland extracts, and by observations on human beings in whom one or other gland is known to be over- or deficiently active. Of recent years, the active principles of a number of these hormones have been isolated and their actions studied. A considerable body of knowledge has been built up, and this has been of great value in the understanding of human endocrine abnormalities and disease.

In disease an endocrine gland may produce an excess or a deficiency of hormone. Such conditions can be recognized by characteristic symptoms. Deficiency can be corrected by hormone treatment in the form of gland extract or of active hormone. Hormones, when so administered, do not stimulate the gland which is deficient, but make up the deficiency. The process, therefore, is one of

substitution rather than stimulation.

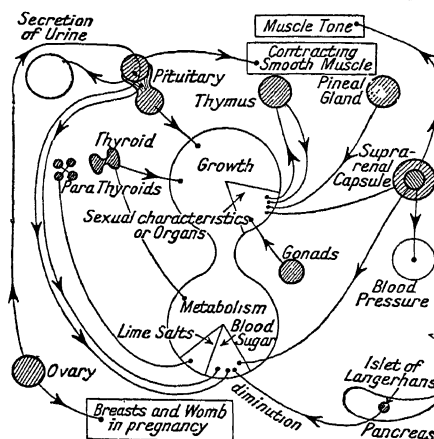
The target of the hormone is some tissue, cell or end organ which it should stimulate; but in some diseases the end organ may not be able to react to stimulation. The target or end organ for a hormone may be another endocrine gland, in which case the hormone is called trophic. The destruction of the gland which produces the trophic hormone will cause failure of the target gland. By the action and interaction of the various endocrine secretions, an elaborate system of humoral control is established. This mechanism plays an essential part in the regulation of the various bodily processes of growth, development, and metabolism.

The chief members of the endocrine series are the pituitary, thyroid, parathyroids, adrenals (or suprarenals), islet of Langerhans (in pancreas), and sex glands. With the exception of the thyroid and the male sex glands, most are located in inaccessible sites, the pituitary lying in a small bony cavity at the base of the skull, the adrenals and the pancreas on the back wall of the abdominal cavity, whilst the parathyroids lie behind the thyroid at the root of the neck.

Functionally, they can be considered in two main groups: those concerned with growth, development and reproduction on the one hand, and those concerned with metabolism on the other.

The anterior lobe of the pituitary secretes a growth hormone. In every organism there is an inherent tendency to grow, and genetic influences no doubt play the most important part in determining the stature of human

beings. On the other hand, this is influenced by the growth hormone of the pituitary, which acts by stimulating the growth cartilages of the bones. Development, and particularly development of the secondary sex characters in each sex, is due to the specific hormones of the sex glands. They are also responsible for reproduction—spermatogenesis in the male and the development of the ovum and follicle in the female. Both development and reproduction are under the control of the pituitary



**Endocrinology.** Diagram showing the main glands of internal secretion and their action

through its gonadotrophic hormones. Certain cells of the adrenal cortex, closely related to the sex glands, have an androgenic influence and, if present in the female, have masculinising effects.

The thyroid controls the general level of oxidative processes or basal metabolism of the body. From the raw material iodine, it produces its hormone, thyroxine, a metabolic stimulant.

Of the glands concerned with more specific metabolic processes, the pancreas, through its islet tissue, produces insulin which controls the utilisation of carbohydrate in the body and its storage in the muscles and liver. Water metabolism is controlled by the posterior pituitary which produces an anti-diuretic hormone controlling the output of water from the kidneys. The parathyroids and adrenal cortex regulate the inorganic constituents and electrolytes of the body. The parathyroids are concerned with calcium and phosphorus metabolism and determine the output of these substances from stores in the bones. Calcium and phosphorus are important in the structural stability of the skeleton and the functional stability of the nervous system. The adrenal cortex regulates sodium and chloride metabolism and controls the output of these substances from the kidneys. Sodium and chloride are essential to the maintenance of water balance in the body. With deficiency of cortical hormone, there is a leak of sodium and chloride from the kidneys.

The adrenal medulla has an emergency function and produces adrenalin. This accelerates the heart rate and amplifies heart action. In other ways it mobilises energy and prepares the organism for action.

The pituitary has been called the master gland owing to its central position and trophic hormones. In addition to the functions mentioned, it controls the thyroid, adrenals, probably pancreas, and possibly other glands. It is closely connected at the base of the brain with nerve centres integrated with higher levels of the nervous system. The two main controlling mechanisms of the body—nervous and endocrine—thus function together.

H. Gardiner Hill

**Endoderm.** The innermost of the three layers into which the walls of a gastrula can ideally be divided. It forms the gut and its derivatives. *See* Gastrula.

**Endogamy** (Gr. *endon*, within; *gamos*, marriage). Primitive institution binding a man to marry within his own social group only. The best developed example is the Hindu caste, with exogamous clans or gotras. *See* Family; Marriage.

**Endolymph** (Gr. *endon*, within; Lat. *lymphā*, water). Anatomical term denoting the fluid which occupies the interior of the membranous labyrinth of the ear of higher animals. *See* Ear.

**Endometritis** (Gr. *endon*, within; *mētra*, womb). Inflammation of the membrane lining the interior of the uterus or womb. *See* Womb.

**Endophyte** (Gr. *endon*, within; *phyton*, plant). Name given to a plant which lives in other plants. *See* Fungus; Parasite.

**Endoplasm.** The inner, more granular, part of the cytoplasm of such an animal as amoeba. It is probably normally in the physical condition of a sol, distinguished from the ectoplasm which, covering the surface, is probably normally a gel. It seems likely that the one can become the other by thixotropic change.

**Endor.** Village of Palestine, now known as Endur, about 6 m. S.E. of Nazareth and close to Mt. Tabor. It was the home of the witch whom Saul consulted.

**Endorsement** OR **ENDORSEMENT** (Lat. *dorsum*, back). Something written on the back of a document. Its most familiar form is that of the signature which must be put upon the back of a cheque, bill of exchange, etc., when it is passed from one person to another. The endorsement must correspond with the name on the front or it will be irregular. By endorsing a cheque or bill the owner transfers his rights to another.

**Endosperm** (Gr. *endon*, within; *sperma*, seed). Tissue found in the seeds of Gymnosperms and many flowering plants, and in spores of selaginella. In the pines (Gymnosperms) the endosperm is formed before the embryo comes into existence; in the flowering plants proper (Angiosperms) embryo and endosperm are formed simultaneously. If a longitudinal section is made of a ripe pine-seed, for example, the embryo will be found to occupy a central cavity, surrounded by a mass of cellular tissue. This is the endosperm, which is gradually absorbed as food by the developing embryo or seedling to tide over the critical period in which it is establishing its roots and expanding its first leaves.

**Endothermic** AND **EXOTHERMIC** COMPOUNDS AND REACTIONS.

Terms used in chemistry to distinguish between compounds which are formed from their elements with the absorption of heat (endothermic) and compounds formed from their elements with the evolution of heat (exothermic). Carbon disulphide is an endothermic compound; carbon dioxide an exothermic compound. An endothermic reaction is a chemical change that requires heat in order to take place; an exothermic reaction is one that evolves heat. If sulphur trioxide is added to water, sulphuric acid is formed with evolution of heat; if sulphuric acid is mixed with water, a hydrate of sulphuric acid is formed with evolution of heat: both these are exothermic reactions. The endothermic compounds are in general less stable than the exothermic ones. The reduction of iron in blast furnace is an exothermic reaction, heat being evolved in the process. The formation of nitroglycerine is an endothermic process and nitroglycerine an endothermic compound.

**Endowment** (Lat. *dos*, a dowry or gift). Gift of money or land to which the idea of permanence is attached. Endowments indicate the vast amounts that have been given or bequeathed for the support of churches, colleges, schools, hospitals, and charitable institutions of all kinds. In the U.K. ancient endowments are under the general control of the state, acting through bodies appointed to supervise them. Such are the Church Commission that controls the endowments of the Church of England, and the Charity Commission that controls funds left for almshouses, hospitals, and the like. Endowed schools are under the supervision of the Minister of Education. The process of time frequently makes trusts governing old endowments quite out of keeping with the age, and so from time to time parliament has dealt with the matter. Thus the Endowed Schools Acts of 1869-89 removed many abuses and gave these trusts a more modern spirit.

**Endurance.** In mechanics, the quality of a material which allows it to sustain the stresses to which it may be subjected. In fatigue testing, to which the term particularly relates, the endurance of a specimen is the number of repetitions of the applied stress cycle which have been sustained at the moment of fracture. The value of the stress range which is then just insufficient to cause fracture is known as the endurance limit.

This endurance limit, or fatigue limit, is often expressed as a ratio of the ultimate strength of the material under test, this ratio being known as the endurance ratio.

**Endymion.** In Greek mythology, a youthful shepherd of great beauty. Of him the moon-goddess Selēnē became enamoured, as he lay asleep on Mt. Latmos in Caria. Selēnē caused him to sleep for ever, so that she might be able to visit him and kiss him every night without his knowing it.

**Endymion.** Poetic romance in four books of rhymed couplets by John Keats, first published in 1818. A rhapsodical rendering of the classic story of the beautiful youth who inspired love in Cynthia, it is full of poetic riches, both of language and of thought. Its opening line "A thing of beauty is a joy for ever," has become one of the most familiar of quotations.

**Endymion.** Novel by Benjamin Disraeli, earl of Beaconsfield, first published in 1880. It is a presentation of political and social life in England during the middle of the 19th century, opening with the death of Canning and passing lightly through the Reform period. Though the story is slight, the characterisation is brilliant; and the narrative has much of the sparkle and less of the ornateness of Disraeli's earlier novels. Many of the characters were but thinly disguised delineations of actual people of the period, Lord Palmerston, Lady Jersey, and others.

**Enema** (Gr., injection). Fluid injected into the rectum. Enemata are used for washing out the rectum to relieve constipation, when they usually consist of a pint or more of soap and water, or of oil to soften the faecal mass. Substances such as quassia may be thus introduced into the bowel for the destruction of thread worms. Normal saline may be run in with a view to its absorption in a dehydrated patient who cannot swallow fluid, and in such cases nutrient substances such as raw egg, glucose, or peptonised milk may also be used.

**Enemy** (Lat. *inimicus*). Generally one who is antagonistic or hostile. In time of war, however, it has a special and narrower meaning referring to the state and its subjects with which another state is at war. By the laws of war these are on a very different footing from friends or neutrals. Their persons and property can be seized, and freedom of movement denied to such of them as are on the soil

of the country with which they are at war. They become enemy aliens, sharply distinguished from friendly or neutral aliens.

**TRADING WITH THE ENEMY.** At least since the Napoleonic wars it has been recognized as vitally



Endymion. Greek statue of the sleeping shepherd in the British Museum

important to prevent the enemy obtaining goods, credit, and other resources which will help him in carrying on war. Before 1914 trading with the enemy was forbidden and made a criminal offence by English common law. In most other branches of the law, the test whether or not a person is an enemy is his nationality; but this test would not be satisfactory in connexion with trading with the enemy, as the objects of the law would not be achieved if persons in England were forbidden to trade with enemy nationals but free to trade with persons resident in enemy territory who were of neutral or even British nationality. In this connexion, therefore, enemy means any person of whatever nationality residing in any territory occupied by the enemy. It was held by the house of lords in 1943 that a Dutch trader in Holland during the German occupation was an enemy, even though he might be bitterly opposed to the Germans and was trading merely to make a living.

During both Great Wars, legislation was passed under which any person—whether of enemy or of neutral nationality or even a British subject—might be deemed by order in council to be an enemy. The names of such persons were placed on a black list. Common law rules, found insufficient, were also widely supplemented. The Trading with the Enemy Act, 1939, as amended by Defence Regulations, gave extensive administrative powers to the Board of Trade and the Treasury. Where any business in Great Britain was suspected of trading with the enemy it could be inspected and its affairs supervised by the Board of Trade; any business carried on by or under the direction of an enemy or

enemy national could be controlled and wound up by the Board. Custodians of enemy property were appointed with the right to recover all sums due to an enemy. The Act of 1939 was not passed as a temporary wartime measure. The maximum penalty for trading with the enemy is seven years' penal servitude.

**Energiser.** Material used in the carburising process to accelerate the rate of adsorption of carbon by the steel being carburised. Energisers usually consist of metallic carbonates, chiefly those of sodium and barium, added to the carburising compound to the extent of 5 to 20 p.c. by weight. They act by decomposing to give off carbon dioxide gas, which reacts with the carbonaceous matter in the carburising compound to form carbon monoxide gas. Some regard these carbonates as reacting with carbon monoxide gas and producing by catalytic decomposition a reactive form of carbon, which is absorbed rapidly by the steel. Accelerators are also employed in other processes, such as cyaniding, chromium deposition and vitreous enamelling.

**Energy.** Term in physics often defined as capacity to do work (*q.v.*). It can be thought of either as accumulated work, or as "what is used up when work is done." In mechanics energy is measured as the product of the force acting and the distance (in the direction of the force) through which it acts. The units are the units of work. Thus if a vertical force raises one pound weight through one foot the energy expended (and also the work done) is one foot-pound. In the C.G.S. system the unit is the erg, equal to one dyne acting through one cm; in the F.P.S. system it is the foot-poundal. Since the erg is very small, a practical unit, the joule, is used, equal to  $10^7$  erg.

Mechanical energy can take two forms: (1) kinetic energy, possessed by a moving body because of its motion (it is the kinetic energy of a running billiard ball which enables it to knock another one on): this is equal to  $\frac{1}{2}mv^2$ , where  $m$  is its mass and  $v$  its velocity; (2) potential energy possessed by a body because of its position (it is the potential energy of a clock weight which is eventually expended in driving the clock): this is equal to the work which would be done in moving the body to its actual position from a natural position

of rest. If (unlike the clock weight) it is allowed to relapse freely to its position of rest, it will progressively lose potential energy and acquire a corresponding amount of kinetic energy.

It took many years for the important distinction between force and energy to be realized, and to some extent the progress of physics was held up until Kelvin suggested and defined the term in 1851. Meanwhile, it was gradually established that quantities such as heat (as distinct from temperature), electric current, and radiation are also forms of energy, and that energy may be stored up in chemical compounds and released or absorbed by chemical reactions. Between 1845 and 1850 Joule conducted a series of experiments, in which he heated water by stirring it with paddles driven by weights falling through a known distance, and found that it always took 772 foot-pound of energy to raise 1 pound of water through 1° F. This gives for the relation known as Joule's equivalent, or the mechanical equivalent of heat,  $J = 4.153$  joule per calorie. The modern figure, from more accurate electrical experiments, is about 4.1855 abs. joule per 15° cal. From the discovery of this fixed relation the whole science of thermodynamics (*q.v.*) developed and the principle of conservation of energy became firmly established.

Joule converted mechanical energy to heat. A steam engine converts chemical energy in the coal to heat, and the heat in turn to mechanical energy. In most steam engines only about 15 per cent of the chemical energy is recovered as mechanical energy; the rest is dissipated in furnace heat that does not reach the water, in steam pressure not applied to the pistons (e.g. escaping in the blast), in overcoming friction, etc. An electric generator may convert potential energy in high lying water into electric current, which may then be used to produce heat, light, or mechanical energy. Heat, however, which is the kinetic energy of the rapidly moving molecules, can be converted into mechanical or electrical energy only if there is a difference of temperature; otherwise there is no way of harnessing the individual molecules. Hence Kelvin's distinction between "available" and "diffuse" energy, and the modern conception of entropy (*q.v.*).

Einstein's Special Theory of Relativity suggested that mass

might be convertible into energy on the basis of the relation  $E = mc^2$ , where  $E$  is the energy,  $m$  the mass, and  $c$  the velocity of light. This has since been found to take place in atomic disintegrations, where the mass of the original nucleus is greater (by about 8 parts in 10,000) than the sum of the masses of the nuclei formed. The disappearance of 1 gm. of mass produces  $8.99 \times 10^{20}$  erg of energy. In atomic physics, however, it is convenient to use another unit, the electron-volt (e.V) equal to the energy acquired by one electron accelerated through one volt: 1 e.V. =  $1.601 \times 10^{-12}$  erg; 1 M.e.V. =  $10^6$  e.V.

**Enfantin**, BARTHÉLEMY PROSPER (1796-1864). French Socialist. Born in Paris, Feb. 8, 1796, he was educated at the École Polytechnique. In 1825 he met Saint-Simon and adopted his teaching, which he and Bazard disseminated during the next five years. In 1832 he was sentenced to a year's imprisonment for his public advocacy of free love. After a journey to Egypt he was appointed postmaster of Lyons, and in 1845 became a director of the Paris-Lyons rly. He died in Paris, Aug. 31, 1864. Enfantin's principal works are *Doctrine Saint-Simonienne*, with Amand Bazard, 1830; *Économie Politique*, 1831.

**Enfield**. Urban dist. and parl. div. of Middlesex, England. It is 10½ m. N. of London by rly; the Piccadilly line also serves its W. part, although the station (Oakwood) lies just beyond the boundary. The New River intersects the town. The chief building is the parish church of S. Andrew, parts of which date from the 12th century, and which contains the beautiful 15th century Tiptoft brass. The palace, built by Edward VI for his sister Elizabeth, has been demolished, but the panelling, a chimney piece, and a ceiling were transferred to Little Park. The grammar school was founded in 1557. The King and Tinker inn is associated with James I. Near the Ridgeway and the residential W. portions of the dist. a large area forms part of London's green belt. The E. of the district is populous, with an electrical industry. At Enfield Lock is the Royal Small Arms Factory, erected in 1856. Two M.P.s are returned. Enfield is mentioned in Domesday Book as Enefelde. Edward VI and Queen Elizabeth lived here, and Enfield Chase, disforested in 1777, was a favourite hunting ground of

James I. It has associations with Keats, Marryat, Isaac D'Israeli, and Lamb. Pop. est. 100,000.

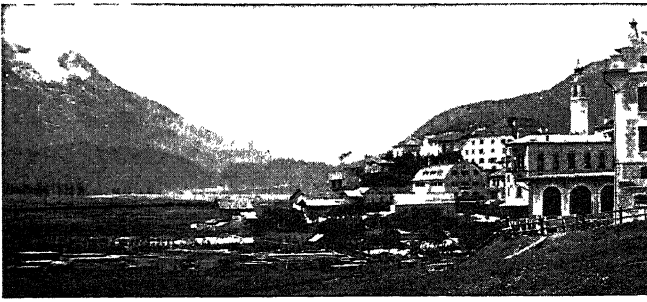
**Enfield Rifle**. Weapon issued to the British army in 1852 to replace the Minie rifle, and used in the Crimean War. The original Enfield rifle was a muzzle-loader, but in 1866 it was converted to breech-loading. The barrel was 29 ins. long, the rifling consisting of five grooves with a twist of 1 in 48; it fired a hollow-based bullet. The rifle had a range of 1,000 yds. It was replaced in 1888 by the Lee Metford. *See* Rifle.

**Enfilade** (Fr. *enfiler*, to thread). Military expression which indicates fire along the direction of the enemy's line or trenches, *i.e.* from a flank. It robs the defenders of an entrenched position of their cover unless the line is well traversed; and few weapons in the line can be brought to bear to counter it. If a unit in action has to change its front it runs grave risks of coming under enfilade fire at once. The advantage of gaining a position on the enemy's flank when attacking is enhanced by the opportunity it gives of subjecting him to enfilade fire. In defensive positions machine-gun posts are sited on the flanks to bring enfilade fire upon troops making a frontal assault. *See* Artillery; Tactics.

**Enfleurage**. Extraction at ordinary temperatures by a non-volatile solvent of the perfume of delicate flowers. The solvents generally used are the finest lard, olive oil, and sometimes high quality mineral oils. The flowers are added to the melted fat or warmed oil, and the mass is stirred to assist extraction. In cold enfleurage fat is spread on both sides of a sheet of glass surrounded by a wooden frame (chassis), the flowers being spread on the upper surface. Charged frames are built up so that a chamber is formed of which the top and bottom faces are covered with fat. From the products of enfleurage perfume materials are prepared by extraction with alcohol. The process is carried out at Grasse, the centre of the French perfumery industry.

**Engadine**. Upper portion of the Inn valley, Switzerland, in the canton of Grisons. Divided into the Upper and Lower Engadine, it stretches 60 m. between two chains of the Rhaetian Alps, and is 1 m. to 1½ m. broad. From Martinsbruck, on the border of Tirol, it runs S.W. up to the Maloja Pass, traversed by a good carriage road, and there are rlys. to St. Moritz and Pontresina. The





Engadine. Village of Samaden in the Upper Engadine, with the Piz Rosatsch on the left

Upper Engadine has a series of small lakes and is more frequented than the Lower Engadine, which, however, has the attraction of its mineral springs at Schuls. The sides of the surrounding mts. are covered with pine forests to the height of 7,200 ft. The strong, bracing air of the valley renders it an extremely popular health resort. The inhabitants, mostly Protestants, still speak Latin or Romansch, a speech akin to Italian and French.

**Engagement.** Word meaning originally to bind by a gage or pledge, and used in several senses. It means an undertaking to marry and also a more general kind of pledge—e.g. an engagement to pay a debt or to meet a friend. It is also used as a synonym for a battle; this comes from an old meaning of engage, that of joining or fastening, as when, in architecture, two beams engage or interlock.

Historically, the Engagement is the agreement signed, Dec. 26, 1647, by Charles I and the Scots represented by the marquess of Hamilton. Charles was a prisoner at Carisbrooke, and he agreed, in return for Scottish assistance in restoring him to the throne, to establish Presbyterianism in England. See Charles I.; Civil War.

**Engelberg.** Village of Switzerland, in the canton of Unterwalden. It stands at the N. foot of the Titlis, 14 m. by electric rly. S. of Lucerne. It is a favourite summer and winter tourist resort, with numerous hotels and boarding-houses and an English church. The abbey church is interesting; and the library has 20,000 vols. and 210 MSS. The large Benedictine abbey, founded 1120, was rebuilt in 1729; it has a school and its farm is noted for its cheeses. Engelberg owns common lands, which help to maintain its poor.

Engels, FRIEDRICH (1820–95). German Socialist writer. Born at Barmen, Prussia, Nov. 23, 1820,

he was the son of a cotton spinner. He visited England in 1842 and lived in Manchester from 1850 and in London from 1870 until his death, Aug. 5, 1895. He was corresponding secretary of the International Working Men's Association, or the International, for



Friedrich Engels, German Socialist

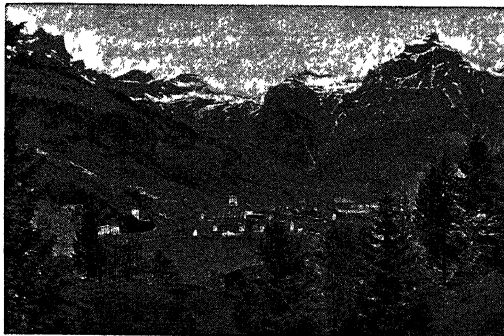
Italy, Spain, and Belgium, an organization formed in 1864 with the object of ending war and subordinating capital to labour. Engels was the friend of its moving spirit, Karl Marx, with whom he collaborated in the communist manifesto of 1847. Engels' works include *The Condition of the Working Classes in England*, 1845, Eng. trans. repr. 1920; and *The Origin of the Family, Private Property and The State*, 1884. *Consult* Life, G. Mayer, Eng. trans. R. H. S. Crossman, 1936.

**Enghien, LOUIS ANTOINE HENRI DE BOURBON CONDÉ, DUC D'** (1772–1804). French nobleman. Born at Chantilly, Aug. 2, 1772, he entered the army in 1788. In 1792 he held a command in the royalist army

raised by his grandfather, the prince of Condé, fighting against the republicans until the peace of Lunéville, 1801. In 1804 he was falsely accused of having taken part in the Cadoudal-Pichegru conspiracy against Napoleon, was seized in the neutral territory of Baden, hurried to Paris and, after a mock court-martial, was shot at Vincennes, March 21, 1804. The murder of the duc d'Enghien, a crime from which Napoleon vainly tried to exculpate himself in St. Helena, occasioned the famous saying of Fouché: "It was worse than a crime; it was a blunder."

**Engine** (Lat. *ingenium*, skill). Appliance for converting energy in the form of heat, or less usually a head of water, into work. In general the heat is first produced by the combustion of some form of hydrocarbon fuel (coal, gas, petrol, or oil) and this is converted into pressure energy either externally to the engine (as in steam engines) or internally (as in gas, petrol, and oil engines). Using the name in its modern sense, an engine has to repeat the same cycle of operations at regular intervals (as with reciprocating engines) or to apply a continuous torque to a rotating shaft by means of jets of fluid (as with steam turbines or gas turbines).

The earliest engines used steam as a working agent. Hero of Alexandria (c. 5 B.C.) used the reaction of jets of steam issuing from a series of nozzles to produce rotation of a globe carrying the nozzles. Branca (1619) used the momentum of a jet issuing from a stationary nozzle and impinging on vanes fixed to the circumference of a rotating wheel. Savery (1698) utilised the pressure of steam acting on the surface of the water to pump water a height of 100 ft. The first practicable reciprocating engine for pumping water from mines was Newcomen's (1712); steam on one side of a piston was condensed, forming a partial vacuum and allowing atmospheric pressure on the other side to overcome the external resistance. Watt (1765) improved the economy of the engine by adding



Engelberg. The Swiss village at the foot of the Titlis Alp

a separate condenser to it and later (1770) utilised the pressure of the steam. Invention of the crank (1781) enabled reciprocating motion to be changed into rotary motion. Trevithick (1800) and Stephenson (1814) applied the engine to locomotives, including slide valves and reversing gear. Symington (1802) constructed the first marine engine. Further developments in steam-engines, including compound expansion (1845), were applications of scientific methods, precision machines, and new materials, until Parsons (1890) invented the steam turbine.

About 1670 Huygens experimented with gunpowder in a cylinder fitted with a piston. In 1820 Farish designed and constructed a small engine to work with gunpowder, but no successful outcome is recorded. Cecil, in 1820, constructed what appears to be the first working gas-engine, using an explosive mixture of hydrogen and air. The free piston engine of Otto and Langen followed, and in 1860 the Lenoir engine, using a mixture of gas and air without compression. De Rochas stated the procedure to be followed by an economical engine, and Otto constructed engines working on his four-stroke cycle. In 1878 Clerk made the first engine working on the two-stroke cycle. Daimler was the earliest to experiment with fast-running petrol engines and in 1883 a De Dion car was fitted with a petrol engine running at 800 r.p.m.

Priestman's, of Hull, were the first firm to use paraffin as a fuel for engines (1885). Diesel published *The Rational Heat Motor* in 1893, and the first successful Diesel engine was built in 1897. Lastly, the combustion gas turbine has made rapid strides in efficiency, and its future commercial operation in large units is assured. See Diesel Engine; Gas Engine; Gas Turbine; Internal Combustion Engine; Locomotive; Oil Engine; Steam Engine; Steam Turbine; Two-stroke Cycle.

A. T. J. Kersey

**Engineer Admiral.** Highest commissioned rank in the engineering branch of the Royal Navy. An engineer admiral's rank is indicated by one broad gold band below three narrow gold stripes, the band and stripes being separated by stripes of purple cloth. Large naval dockyards are generally under an engineer admiral, who is responsible for the running of workshops and repair of warships.

## ENGINEERING: A GENERAL SURVEY

A. H. Gibson, D.Sc., Prof. of Engineering, University of Manchester

*This article states the history of and relationship between military, civil, mechanical, and electrical engineering, and outlines an engineer's duties and studies. See also articles on the various branches of engineering activity, e.g. Bridge, Dam, Electronics, Engine, Road, etc.; and biographies of famous engineers*

Historically considered, engineering is the earliest of the arts, emerging in the dawn of civilization when the first tool was made by man. Little is known as to the earliest development of engineering knowledge. It must have been of a comparatively high order to render possible the construction of the monumental works of Egypt and the East, and the priests of many of the ancient religions probably had an expert knowledge of some branches of mechanics. The aqueducts and bridges built by the Romans, and the remains of metal pumps of the Roman period, show that the principles of civil, mechanical, and hydraulic engineering were well understood before the Christian era.

In England the term engineer as defining an occupation appears to have dated from the 13th century. In the wardrobe account of Edward I (1300) occurs a statement of sums paid to engineers for military artificer's work. In 1344 the army records note the number of engineers on the strength of the ordnance. Their duty was not only to direct warlike engines and weapons, a duty afterwards delegated to the artillery, but also to undertake the design and construction of fortifications, roads, bridges, machinery, and other works of military service.

### Beginnings of Civil Engineering

About the 12th century public attention in France became directed to the internal communications of the country, and an association was formed under the name of the Frères Pontiers with the main object of building bridges. The association was extended throughout Europe, and it built the first stone London Bridge, perhaps the earliest example of a definite body devoting itself to civil engineering works.

The birth of civil engineering in its modern sense was at the beginning of the 17th century. The rivers of N. Italy, which had been in use for navigation and regulated for irrigation from early times, appear to have relapsed into a bad state of order, with the result that many disastrous inundations took place. The most learned scientific men of the day were called into consultation,

which led to studies and experiments. A class of practitioners was called into existence capable of dealing with hydraulic works and with their necessary mechanical arrangements, and the scope of their work was gradually extended to cover also the design and construction of roads, bridges, docks, workshops, and machinery in general. As this class of work was analogous to that allotted to engineers of the military service, the new profession adopted the title of engineer, prefixing the word civil to distinguish its members from their military brethren.

Probably the best definition is that used by the Institution of Civil Engineers, which defines engineering as "the art whereby the great sources of power in nature are converted, adapted, and applied to the use and convenience of man"—which covers all activities of the engineer, whether civil, mechanical, or electrical.

### Mechanical and Electrical Branches

The development of the steam engine led to an enormous and rapid expansion in the branch of civil engineering devoted to the design and construction of motive-power machinery and mechanical appliances, and to the development of manufacturing processes. From this period dates the professional term mechanical engineer. Later, the development of the electric dynamo, and of all the electrical appliances and accessories to electric power and lighting, rendered this sub-branch of mechanical engineering sufficiently important to justify the professional title of electrical engineer.

With further intensive specialisation, aero engineering, agricultural engineering, chemical engineering, and metallurgical engineering are now to all intents and purposes separate professions. In general the term civil engineering is confined to the design and construction of such works as roads, bridges, rlys., docks, harbours, canals, dams, and coast defences, all of which are essentially of a stationary character.

The scientific study of engineering principles is of comparatively recent growth. The first engineering school attached to any university in the United Kingdom was

founded at Glasgow. This was quickly followed by similar schools at other universities, and a training in the profession can now be obtained at any university or technical institute in the kingdom. In mechanical engineering, great developments have taken place in the branch of internal-combustion engineering, using petrol and heavy oils; in steam and internal-combustion turbines; and more recently in jet propulsion for aeroplanes. For many purposes the turbine has supplanted the steam engine, on the use of which the industrial revolution was based.

Developments in the use of atomic energy indicate that engineers may be able to utilise this in prime movers, probably mainly for providing the energy for steam raising in comparatively large plants for generating electricity.

In electrical engineering the development of high-tension overhead transmission lines has rendered it possible to harness large waterfalls and other sources of water-power remote from any industrial centre, and to transmit this energy, developed by the use of hydraulic turbines coupled to electric generators, to be used at the most convenient site. In the U.S.A. and Canada such transmission lines, some of them exceeding 200 m. in length, have long been in use. In view of the success of these systems, of the comparative cheapness with which water-power can be developed, and of the rising cost of coal, great interest is being taken in the harnessing of water-power in most countries of the civilized world, and such hydro-electric development has provided an interesting chapter of engineering history. The increase in the cost of fuel is likely to accelerate the development of hydraulic resources, and has rendered possible the development of tidal power at such sites as the Severn estuary.

The possibility of obtaining large blocks of power at the low prices obtaining in many hydro-electric developments has given a great stimulus to electro-chemical and electro-metallurgical processes. Many processes, partly chemical and partly engineering, e.g. the manufacture of aluminium and the production of electrolytic copper, are commercially possible only where electrical energy at a cheap rate is available. On the European continent much electrical energy derived from water-power is also used for the production of artificial fertilisers from

the nitrogen of the air. In view of the rapid depletion of the world's natural nitrate deposits, and the diminution in fertility of most of the great wheat and cotton growing areas, the production of such artificial fertilisers must become a question of world-wide importance. Among other modern developments in electrical engineering are lighting by the incandescent lamp; traction as applied to tramways and suburban main lines; wireless telegraphy and telephony; and radar.

The developments in civil engineering have been probably less marked than in any other branch. Methods of construction have been in general improved and rendered more efficient by the extended use of labour-saving machinery; the design of masonry structures and of steel bridges has been put on a more satisfactory footing; and the necessity for road surfaces capable of withstanding the wear and tear of high-speed motor traffic has led to advances in the art of road construction. The introduction of ferro-concrete, with its combination of steel bars embedded in concrete to increase its tensile strength, has given rise to a distinctive type of construction, which for bridges, retaining walls, and large buildings often offers many advantages in cheapness of construction and maintenance over the older type of masonry or steel structure.

The material prosperity of mankind depends on the work of the engineer. Its means of communication, transport, and locomotion, whether by land, water, or air; its energy supplies; its water supplies and drainage, are dependent on his activities. Indeed, civilization in the modern sense and engineering may be said to be synonymous. While the enormous range of the subject renders it imperative for the engineer to specialise in one branch of his profession, the training of the young engineer should be on as broad lines as possible, and the wider his grasp of the outlines of all its branches, the better are his prospects of ultimate success. The professional training should include a three years' course in the engineering school of some university or technical institute. The first two years of this course are common to all branches of engineering, and usually include the study of chemistry, physics, and mathematics, and the elementary study of civil and mechanical engineering construction,

strength of materials, heat engines, hydraulics, mechanics, along with design work in the drawing-office.

The third year is usually devoted to a more advanced treatment of the subjects relating to some special branch of engineering, and this theoretical training should be followed by a course of practical work in the appropriate workshops or engineering office. It is in some respects an advantage for the practical training to be taken, whether wholly or in part, before the university course, while in some universities provision is made for a "sandwich" course, in which the engineering student takes his workshop training during the summer of each year and pursues his theoretical studies during the winter.

**Engineer Officer.** Commissioned officer of the Royal Navy. Engineers were first appointed to warships in 1838, when the Royal Navy was experimenting with steam propulsion. The first naval engineers ranked only as warrant officers, and engineers were not commissioned until 1848. In 1878 the Royal Naval Engineering College was established at Keyham Dockyard, Devonport. Since 1903 engineer officers have been trained as executive officers and are competent to take executive duties and rise to the highest ranks. They enter the service as midshipmen and undergo four years' training, most of their time being spent in the dockyard workshops and fitting-out basins at Keyham. If 70 p.c. of maximum marks are obtained at the final examination, engineer midshipmen go to Portsmouth for six months in the torpedo school; they are then commissioned as sub-lieutenants (engineers). Technical specialists, they are responsible for the efficient running of main and subsidiary machinery in warships and the control of the engineering workshops and repairs on board. An engineer officer is distinguished by wearing stripes of purple cloth between the bands of gold lace denoting his rank.

**Engineers, SOCIETY OF.** British learned society. Established in 1854, it was incorporated in 1910, when it was amalgamated with the Civil and Mechanical Engineers' Society, dating from 1859. It exists to further the interests of the engineering profession as a whole. The society consists of fellows, members, associate members, and associates, and its head offices are situated at 17, Victoria Street, Westminster, S.W.1.





# ENGLAND: ITS TOPOGRAPHY, HISTORY, ETC.

A. D. INNES, Author of *A History of England: and Others*

*A description of England, from the topographical, the geological, and the climatic points of view, is followed by some account of its industries and communications. Then come sections dealing with its government and its history, the latter being taken down to 1707, from which date it is continued under the heading of United Kingdom. In addition, some thousands of articles describe the counties and towns, rivers and mountains of England, deal with the lives of kings and statesmen, with wars, battles, and political and social movements. Government, local and national, is described in detail under Borough; County; Parish; Parliament, etc.*

England, (A. S. Engla land, the land of the Angles), covers the larger and southern part of the island of Great Britain, excepting only that western part of it known as Wales. It is bounded by Scotland on the N. and Wales on part of the W.; elsewhere its borders are the North Sea on the E., the English Channel on the S., and the Atlantic Ocean and the Irish Sea on the W.

The area of England is 50,874 sq. m., being about five-ninths that of Great Britain. It measures 430 m. in extreme length, from the Lizard to Berwick-on-Tweed, and 370 m. in extreme width, from Land's End to Lowestoft. The coast, especially on the W., is broken with numerous openings, making a total length of 1,800 m. The W. coast is high and rocky, bold cliffs and buttresses of hard rock standing out to sea. On it are three large openings—Solway Firth, Morecambe Bay, and the Bristol Channel, as well as the mouths of the Ribble, the Mersey, and the Dee, which, however, is Welsh on one side. The chief headlands are St. Bees Head, Hartland Point, and Land's End.

The S. coast combines the peculiarities of both the E. and W. coasts, the two sections being divided by the Isle of Wight. East of this is a coast-line with a low, clay shore, broken here and there by chalk cliffs; W. of it the coast is high and bold. Several good harbours include Portsmouth Harbour, Southampton Water, Weymouth Bay, Tor Bay, Plymouth Sound, Falmouth Harbour, and Mount's Bay. The chief headlands are the Lizard, Start Point, Portland Bill, St. Alban's Head, Selsey Bill, Beachy Head, Dungeness, and the S. Foreland.

The E. coast is regular in outline, broken only by the estuaries of rivers. In places it is high and rocky, but much of it is low and sandy, and along parts of it the sea is encroaching. The principal river mouths are those of the Tyne, the Tees, and the Humber, the Great Ouse and the Thames. The chief headlands are Flamborough Head, Spurn Head, Lowestoft Ness, the Naze, and the North Foreland. The N. boundary is formed by the

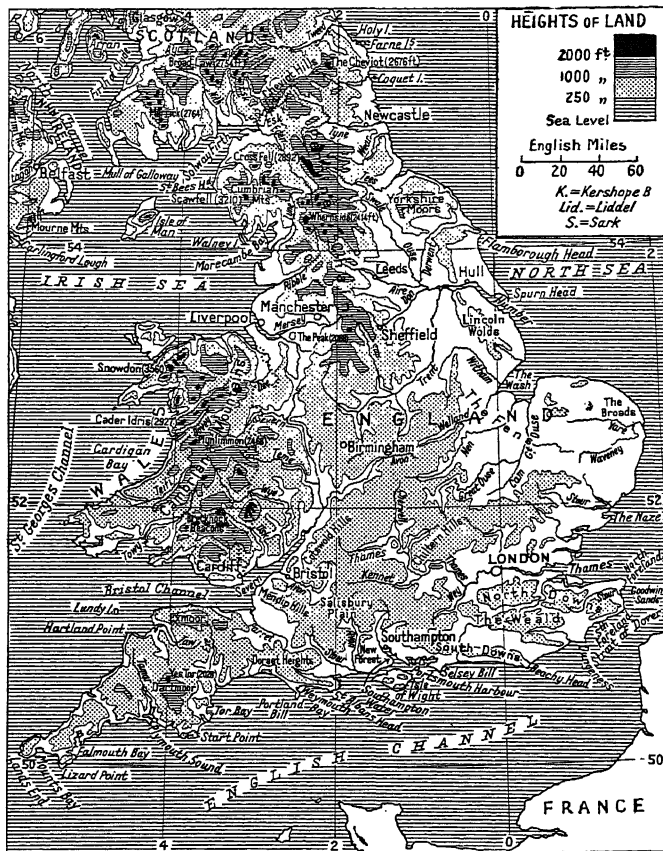
course of the Tweed, the line of the Cheviots, and Kershope Burn, Liddel Water, the Esk, and the Sark, falling into the Solway. This border is a little under 100 m. in length.

There are few important islands off the coast of England. The Isle of Man, mid-way between the Cumberland coast and Northern Ireland, is not strictly part of England, having its own laws and government. Off Northumberland are the Farne Islands, Lindisfarne or Holy Island, and Coquet Island. Foulness Island is off Essex. Off the W. coast are Walney Island, opposite Barrow, and Lundy Island in the Bristol Channel. Off Land's End is a group, the Scilly Islands.

The Isle of Wight is largest of all and ranks as part of Hampshire.

England is divided into 41 counties, including London, which was formed in 1888 out of parts of Middlesex, Surrey, and Kent. Some counties are subdivided for administrative purposes, while in the three ridings Yorkshire has a more historic division. The counties, with their acreage, which includes the sheets of water therein, and their population according to the census of 1931, are shown in the table in page 3070. The number beside each county indicates its relative position as regards size and population.

The census of April 27, 1931, showed the population of England



England. Physical map, showing the main mountain ranges of England and Wales, the principal rivers, and the coastal features



to be 37,794,003; 18,061,643 males and 19,732,360 females. Figures for the previous decennial censuses were: 1921, 35,681,019; 1911, 34,045,290; 1901, 30,813,043. No census was taken during the Second Great War, but on the last day of June each year an estimate of civilian population was made from vital statistics, the figure in 1949 being 41,214,000. The losses of war had therefore been made good by an increase of births. Much allowance has to

From the recently laid-down alluvial deposits of the Wash to the oldest rocks present in Cumberland and Cornwall the geological series is almost complete. England has been gradually built up by successive additions to the older Cumbrian and Cornish lands as the marine deposits of the several geological ages have permanently emerged from below the sea.

The old western lands occur in three portions. The Lake District is the oldest, with Ordovician and

Between the rivers Tweed and Trent the carboniferous rocks form a chain of uplands which makes a definite water-parting between the rivers of the North and the Irish Seas. Flanking the Pennines are the coalmeasures, which lie in pairs. In the N. the Cumberland and Durham and Northumberland coalfields reach the coast; S. of the range the Lancashire and N. Staffordshire coalfields on the W., and the York, Derby, and Nottingham coalfield on the E., lie on the slopes between the watershed and the almost flat plains of Cheshire and the vales of York and Trent.

Farther S. the carboniferous rocks only appear in detached fragments in the midland coalfields between the Trent and the Stratford Avon; in the mountain limestone and the Forest of Dean coalfield on the edge of the Old Red Sandstone of the Wye and Usk.

#### The New Red Sandstone

On the E. margin of the carboniferous rocks, along a line from the mouth of the Tyne to that of the Exe, are detached portions of the Permian system. From Tynemouth to Nottingham both Permian sandstone and magnesium limestone appear in long narrow bands.

Triassic rocks cover a V-shaped area reaching from Middlesbrough to Gloucester, and from Gloucester to the shore of Morecambe Bay. Detached portions fringe the coast of the Lake District, form the valley of the Lower Eden, and extend across the isthmus of the Cornish peninsula. Their best known representative is the New Red Sandstone. Triassic rocks are associated with lowlands, the vale of York, the valley of the Trent, the Cheshire plain, the Fylde of Lancashire, and the lowlands W. of the Severn.

The remaining portion of England comprises rocks which have no representatives on the W. The Lias stretches in an almost unbroken band from Lyme Regis, E. of the Severn and the Stratford Avon, E. of the Trent, and from Goole to the coast near the mouth of the Tees. Fringing the lias along its eastern margin lies the oolitic limestone, which gives rise to a line of residual hills, from the Cotswolds to the N. York moors.

Between the Wash and Dorset a narrow band of Greensand separates the oolite from the chalk which gives rise to a series of hills—the E. Anglian Heights, the Chilterns, the Marlborough, and N. and S. Downs. Within the V-shape of these hills lies the London basin with its young rocks.

#### ENGLAND: AREA AND POPULATION OF EACH OF THE 41 COUNTIES

County	Area (acres)	Size Order	Population	Pop. Order
Bedfordshire .. ..	302,942	37	220,525	35
Berkshire .. ..	463,830	32	311,453	29
Buckinghamshire ..	479,360	30	271,586	31
Cambridgeshire ..	553,241	25	218,702	36
Cheshire .. ..	652,383	19	1,087,655	12
Cornwall .. ..	868,167	14	317,968	28
Cumberland .. ..	973,086	11	263,151	32
Derbyshire .. ..	647,824	21	757,374	15
Devon .. ..	1,671,364	3	732,968	17
Dorset .. ..	622,843	21	239,352	34
Durham .. ..	649,420	20	1,486,175	7
Essex .. ..	979,532	9	1,755,459	4
Gloucestershire ..	804,638	17	786,000	13
Hampshire .. ..	1,055,811	7	1,102,770	11
Herefordshire ..	538,924	27	111,767	38
Hertfordshire ..	404,520	35	401,206	25
Huntingdonshire ..	233,985	38	56,206	40
Kent .. ..	975,965	10	1,219,273	9
Lancashire .. ..	1,200,122	6	5,039,455	1
Leicestershire ..	532,779	28	541,861	20
Lincolnshire ..	1,705,293	2	624,589	19
London .. ..	74,850	41	4,397,003	2
Middlesex .. ..	148,691	39	1,638,728	5
Monmouthshire ..	349,569	36	434,958	23
Norfolk .. ..	1,315,064	4	504,940	21
Northamptonshire ..	638,612	22	361,313	27
Northumberland ..	1,291,978	5	756,782	16
Nottinghamshire ..	540,015	26	712,731	18
Oxfordshire .. ..	479,224	31	209,621	37
Rutlandshire .. ..	97,273	40	17,401	41
Shropshire .. ..	861,800	15	244,156	33
Somerset .. ..	1,036,818	8	475,142	22
Staffordshire ..	737,858	18	1,431,559	6
Suffolk .. ..	945,269	12	401,114	26
Surrey .. ..	461,833	33	1,180,373	10
Sussex .. ..	932,471	13	789,359	14
Warwickshire ..	624,676	23	1,535,007	6
Westmorland .. ..	504,917	29	65,408	39
Wiltshire .. ..	860,829	16	303,373	30
Worcestershire ..	447,678	34	420,056	24
Yorkshire .. ..	3,891,967	1	4,389,679	3

be made, in considering the population of various counties, for movement of people during the war.

**GEOLOGY.** The situation of England with reference to France and the continent of Europe is of supreme importance. The E. and S. coasts make an angle with its vertex just where the British seas are narrowest. Through this S.E. corner continental civilization reached England, and through it England maintains its closest ties with modern Europe. The English people, as distinct from the Scots, Welsh, and Irish, comprise diverse elements, and similarly the English land consists of rocks representative of many more geological ages than are encountered elsewhere in the British Isles.

Silurian rocks and large massive or eruptive basalt. The Cornish peninsula and Herefordshire are mainly Old Red Sandstone and Devonian rocks with eruptive granites in Cornwall. Here the rivers have bitten into the rocks and carved the upland into steep-sided, narrow winding valleys. Between rounded smooth-topped ridges and domes lie marshy alluvial flats, where the streams meander across valley bottoms made by more powerful torrents. In the Lake District the ice sheet gave a slightly different character to the land surface, and in the valleys carved by glaciers long narrow lakes walled by steep slopes radiate from a central knot of mountains, the result of former volcanic action.

The N. and S. Downs are relics of a ridge of chalk which was raised as the Wealden uplift to form a continuous ridge from Wiltshire to France. The middle of the ridge has been worn away to form the Wealden plain and expose the Greensand along the inner scarped edge of the chalk, the Wealden clay within the Greensand, and the Hastings Sand within the clay.

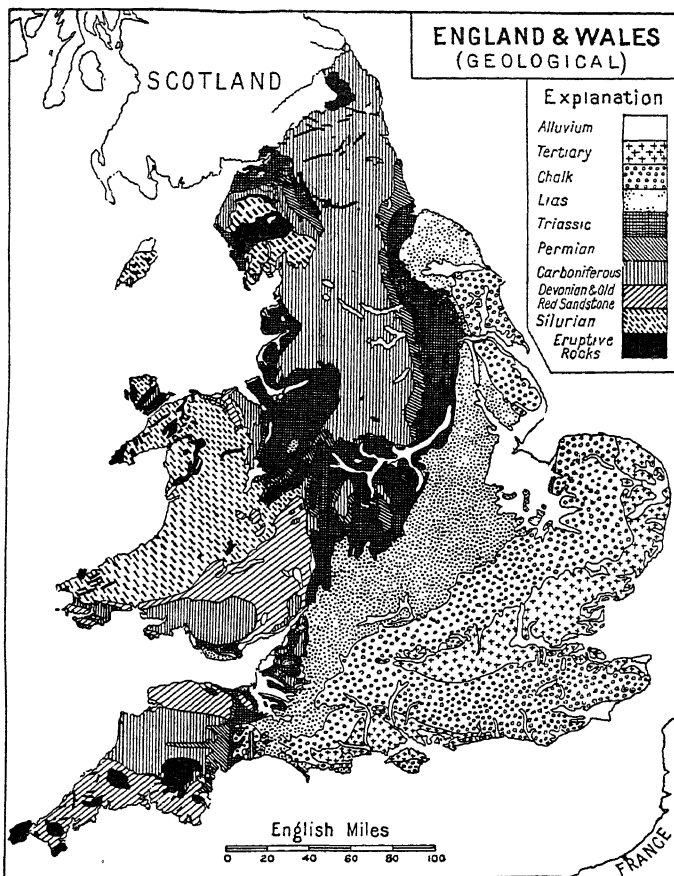
#### Scenic Differences

Each of these geological horizons has been weathered into characteristic land forms. The steep cliff faces of the Millstone Grit in Derbyshire are in striking contrast to the chalk landscape of the downs, marked by rounded contours. The Triassic landscape of the vale of Trent or the Cheshire Plain differs widely from either the oolitic Oxford Clay or the younger London Clay of Herefordshire or Middlesex.

These scenic differences are emphasised by the vegetation typical of each type of rock. The beeches and silver birches of the sandstone of Sherwood Forest differ widely from the woodland which clothes the sides of the narrow Cornish valleys and leaves the uplands bare.

Similarly, the coastal edges of the formations give an infinite variety to the shores of England. The chalk cliffs of Dover and Beachy Head, with their vertical white faces, differ from the sandy cliffs exposed near Bournemouth in the eocene of the Hampshire basin; the miles of iron-bound coast along N. Cornwall from Tintagel southwards are totally different from the sandy lowland shores of the Triassic formation in the Wirral peninsula. In Norfolk and Suffolk the cliffs are noteworthy for their yellow, orange, and reddish hues, their friable texture and tendency to fall away. They are among the newest of England's cliff formations.

**RIVERS AND VALLEYS.** Although the highest ground of England is largely due to those foldings of the earth's crust which produced the Pennine and Wealden uplifts, the residual features are largely the work of rivers. In the N.E., in Northumberland and Durham, the North Sea drainage reaches to a water-parting on the western side of the Pennines; near Cross Fell (2,930 ft.) the Tyne, Wear, and Tees rise close to one another. From Haltwhistle the S. Tyne and the Tyne itself flow due E.; the valley of the S. Tyne leads W. through the Tyne Gap in the Pennines at a lower elevation than 500 ft. to Carlisle. The Coquet, Wansbeck, and Blyth cross the coastal plain of Northumberland, and the Wear



England. Map showing the general geological formation of England and Wales

and Tees for more than half their length find their way along the Durham lowland.

Between Teesmouth and the Wash almost the whole of the drainage is concentrated on the Humber. The large rivers, except the Yorkshire Derwent, rise towards the W. side of the Pennines, the Trent even on the western slopes, and drop through the dales to the level of the Triassic sandstones and marls in the plains of York and Trent. Richmond, Leyburn, Ripley, Sheffield, Stoke-on-Trent, the first large places on the rivers, mark the termination of Pennine valleys. Lower down stream the rivers flow over the sandstones to the main streams of Trent and Ouse which flow parallel and close to the E. edge of the Trias.

The drainage has hollowed the sandstone into a trough with Lias clays on the E. The Yorkshire Derwent is the one exception to the rule that no long rivers cross the Lias to the Triassic plain.

This stream rises close to the coast, flows across the oolitic vale of Pickering between the Cleveland Hills and the Yorkshire wolds in an abnormal course which was determined originally by the presence of sea ice during the ice age in the North Sea. This ice barrier forced the drainage towards the S.W., so that a permanent valley was carved across the Lias clay.

The Wash, Witham, Welland, Nen, and Great Ouse rivers rise on or close to the Lias, and carving out the low residual oolitic hills, drain the trough of clayey land bounded on the E. by the chalk ridge N.E. of the Chilterns. The water gap at the great bend of the Witham is dominated by the city of Lincoln on the oolite ridge above the river.

Probably the Thames once flowed over dry land to join the Rhine and make a great river which flowed N. across the North Sea floor. The Yare, Waveney, Orwell, Stour, Colne, Blackwater,

and Crouch are thus the relics of longer streams which drained from the chalk ridge eastwards to this parent stream. The Kennet rises in the angle where the Chilterns and Downs chalk ridges meet in the Marlborough downs, and flows in a straight course to the Thames at Reading in the general line towards Southend. This is the real lower Thames, with all the left bank tributaries, Colne, Lea, etc., coming down from the chalk across the London clay.

The upper Thames makes a great break through the chalk at the Goring Gap to reach Reading, and the shape of its basin in the Oxford clay plain between the Cotswold oolitic ridge and the Chilterns is due to the general drainage to the S.E. and the sideways drainage in the clay hollow.

#### River System and Market Towns

The Churn, Coln, Leach, Windrush, Evenlode and Cherwell and the Thames itself between Oxford and Reading flow to the S.E.; the Ray and the Thame (vale of Aylesbury), the Ock (White Horse vale), and the Thames above Oxford flow at right angles to this main direction across the clay.

The Wealden rivers rise along a water-parting which roughly follows the line from Hythe to Hindhead. From the northern clay vale the Wey, Mole, Medway and Stour cut through the N. downs. The Arun, Adur, Ouse and Cuckmere cut through the S. downs to the English Channel. The Rother alone is entirely on the Weald, and crosses the Hastings sand.

The Itchen, Test, Avon, Stour and Frome flow from the chalk to the Hampshire basin. The Avon drains Salisbury Plain. All around the coast from the Wash to Poole harbour the rivers reach the sea along a low coast, where the rise and fall of the tides makes a great difference to each estuary.

The river system in general has determined the situation of the market towns. Guildford, Arundel, and Lewes are gap towns on the downs. Oxford, Reading, Chelmsford, and Norwich have each been influenced by the confluence of two streams.

The peninsular rivers of the S.W. are developed from the Exmoor, Dartmoor, and Bodmin moorlands. The Tamar and Torridge, rising in the Ditchen Hills inland from Hartland Point, are exceptions; the valley of the Tamar makes a lowland way across the peninsula. Falmouth Bay is a typical Cornish estuary. The rivers of the oldest rocks in England are tiny streams which flow into large rock-walled estuaries

which are the drowned valleys of the middle or lower courses of the streams; they indicate a period when the streams were larger, longer, and more powerful, and which preceded the inflow of the sea or the sinking of the coast. The Camel estuary is the only large break in the iron-bound coast of N. Cornwall between St. Ives and Hartland Point; here miles of sand at low water attest the fact that the estuary is too large for the tiny stream which drains into it; the river and estuary are not conformable.

The Parret, Brue, Axe, and Bristol Avon belong to an area where many geological formations are crowded together. The Parret is bounded S. by greensand hills, like Leith Hill in the Weald; the Brue and the Axe belong to Sedgemoor, a fen district in miniature with the limestone Mendip Hills to the N. The scenery of the Mendips repeats that of the Peak district, with lead mines, swallow holes, and caverns. The Cheddar Gorge is, however, without parallel in Derbyshire; the cliffs are probably the sides of a great cave of which the roof has fallen. The Bristol Avon rises in the oolitic Cotswolds, crosses the S. portion of the Oxford clay plain, cuts a gorge through the oolite, crosses a lias clay plain, and cuts a second gorge at Clifton through the carboniferous limestone of the Bristol coalfields to the Bristol Channel.

#### The Severn and Thames

The Severn is a Welsh river of which the middle and lower courses are English. It originated probably as one of a series of streams which flowed in a general S.E. direction from the Cambrian mts. The young stream, in all probability the parent stream of the Thames, flowed across a slope where the surface features were of small magnitude. In time the softer clay rocks of the lias and the oolite were worn away, leaving outstanding sandstone and limestone hills and ridges. Struggles were initiated between the streams and the harder rocks; there was a chance that the Cotswold and Chiltern ridges would cut the young stream into three sections. The Goring Gap was cut through the chalk, but no gorge was made in the oolite, and the young stream grew into two rivers—the Thames and the Severn. On the one hand the Severn is parallel to the Cotswolds and the general lines of the Thame, Thames, and Upper Bristol Avon; on the other, it lies on the lias clay, close to the edge of the Trias, and is related in this respect to the lower Trent.

The vales of Evesham and Berkeley resemble the vales of Newark and York. Above the confluence with the Stratford Avon between Tewkesbury and the Coalbrookdale Gorge at Ironbridge, the Severn valley belongs to the Trias: the Worcester plain is like the plain of Burton on the middle Trent. The Teme, Wye, and Usk may be considered as Severn tributaries. In their English sections they cut valleys in the Old Red Sandstone.

#### Lancashire and Cheshire Estuaries

The Triassic plain of S.E. Lancashire and Cheshire is drained by the Mersey and its affluent the Irwell, the Weaver, and the lower Dee. Their outlets to Lancashire Bay, the Mersey and Dee estuaries, are not conformable with the streams themselves. In both rivers the estuaries are being silted up; sandbanks a few feet below the sea continue the Wirral peninsula far to the N., the main channel winding at low water as a narrow stream across the sand-choked Dee estuary. The bottle-neck formation of the Mersey estuary assists the daily scour of the tides, but large dredgers have to be maintained to provide a regular channel for liners. Ribblesdale belongs to the mountain limestone of the Pennines, and connects with Airedale at the Aire Gap.

Lonsdale is a reminder that the Lune is a Pennine stream with a silt-filled estuary. The tiny streams of the Lake District which reach Morecambe Bay are really longer than the map indicates, since they form definite valleys across Morecambe sands and have lower courses which are only obscured at high tide. The Eden rises close to the sources of the Swale and Ure, flows across Permian sandstone to the Triassic Solway Plain; its affluent, the Irthing, completes the Tyne Gap in the Pennines. Like all the Triassic bays, Solway Firth has vast stretches of sand exposed at low tide. The Lake District culminates in Scawfell, but the lake valleys radiate from Helvellyn. Windermere, Conistone Water, Wastwater, Ennerdale Water, Buttermere, Derwent Water, Basenthwaite, Thirlmere, Ullswater, and Hawes Water are typical lakes of a glaciated area, and fill part of the narrow dales which lead downwards between tree-clad ridges from the central dome where ancient sedimentary rocks are exposed in Skiddaw, and intrusive volcanic rocks raise weathered peaks, as at Scawfell. Walney Island and the coast from Foulney Island to S. Bees Head is Triassic lowland. Windermere, Ambleside and



England. Map indicating the mean actual annual temperature of England and Wales

Keswick are examples of settlements where a route leads from one dale to another.

The shallowness of British seas and the gradual shelving of the English shore are important in reference to the rhythmic pulsations of the tides. In few countries is the tidal effect felt so far up the rivers. In the characteristically English unconformable estuaries the scour of the tides keeps open the regular channels, with the result that there are scores of tidal harbours round the English coasts. No part of England is more than 70 m. from a section of this tide-swept coast.

**CLIMATE AND WEATHER.** Ultimately, the climate depends upon degree of insolation and on currents in the atmosphere between the lower surface inhabited by man and the isothermal layer 5-6 m. up. The lower faces of these currents are disturbed into eddies by the varied configuration of the land surface, but the general movements are steady and continuous. The climate of England is determined within wide limits by the intensity of the sun's rays which it receives; because of its situation England is not tropical like Ceylon, nor arid like Egypt, nor a frozen waste like Spitsbergen.

The limits set to its climate by its latitude are far apart. The precise range of the climate is determined by atmospheric currents, which move in relation to three areas of definite types of atmospheric pressure. To the

S.W. over the Atlantic lies the Azores area of high pressure; to the E. over the mainland, pressure is usually high in winter and low in summer; to the N.W., over the Atlantic, pressure near Iceland is usually low.

The prevalent surface winds are, therefore, those with a westerly direction, which bring oceanic influences to bear. As these winds are usually moisture-laden, rather warm in winter and cool in summer, English seas, rivers, and lakes are seldom frozen, and England has the mildest winter of any part of the world in corresponding latitudes. These results are chiefly due to clouds and consequent rain. England has usually a high percentage of cloud-covered sky, which serves the double purpose of a blanket in winter and of a screen in summer.

In winter, when the earth should cool rapidly and dissipate the warmth stored in summer, the clouds restrict the radiation of heat, condense into relatively warm rain, and in so doing release heat and bring muggy, foggy days. In summer, the clouds screen England from the fierce rays of a sun high in the sky, and supply frequent rains. As more water is evaporated in summer than in winter frequent rainfall means a lowering of the temperature by the absorption of the heat necessary to change the water into gaseous moisture. An English July may therefore be cool and rainy.

The isotherms, which indicate corrected temperatures at sea level, show that in July London is hottest, over 64° F., and the strip of land along the Scottish border is coolest, below 59° F. But in Jan. Land's End is warmest, over 44° F., and the E. coast from Flamborough Head to the Nore is coldest, below 38° F; London is no warmer than Carlisle or Berwick, Liverpool is as warm as Southampton. In summer the isotherms run E.-W. and in winter N.-S.

The actual weather probable at any English town is determined by local conditions of elevation and slope and by general variations from the normal. The prevalent winds usually reach England as depressions following more or less definite tracks from the Atlantic: sometimes the storms are fended away from England because the continental high pressure extends over the S.E. and brings clear skies, cool nights, and a frosty period in winter; at other times the Azores high pressure approaches the S.W., and Cornwall has a succession of bright, sunny days while in the N. the weather is cloudy, cool, and wet.

These general variations affect the entire country, while the surface configuration introduces purely local variations. The annual temperature of England, were it entirely a plain, would lie between 48° F. and 54° F.; the map shows that it actually lies between 38° F.



England Map showing the annual distribution of rainfall in England and Wales

and 52° F., and that the hills are cooler than the lowlands. Really the S. coast, the London area, and the lowlands of the S.W. are warmest, the Lake District is coldest, and the Vale of York is as cool as the tops of the N. Downs or the Chilterns. The rainfall map shows primarily the effect of elevation; the wettest place in England is in the Lake District, and even minor ridges are wetter than the plains beneath; the tops of the Downs receive more rain than the Weald plain. But rain clouds come from the ocean, so that the W. of England is wetter than the E. Dartmoor and Bodmin Moor are wetter than the Peak, and the 500 ft. level on the Lancashire slope of the Pennines receives 10 ins. more rain a year than the corresponding level on the Yorkshire slope; Holderness is drier than the Wirral.

The actual number of hours of sunshine experienced in England varies considerably: e.g. Cornwall, Essex, and the S. coast receive yearly about 1,700 hours, the E. slopes of the Pennines less than 1,200 hours. But the difference is largely neutralised by the slope of the ground. Although the sun shines almost equally upon both sides of the S. Downs the southern slopes are so tilted that the sun's rays have an increased heating effect, while the northern slopes are tilted away from the sun.

The climate and weather of England have, therefore, a definite character. There are few extremes, there is constant change, and, within a small area or a short period, considerable variety.

**MOVEMENTS OF POPULATION.** Celt, Saxon, Dane, and Norman left their impress upon the English people, and the prosperity of England later attracted Welsh, Scots, and Irish from within the British Isles and strangers from the Continent. British freedom drew many immigrant aliens from Central Europe, particularly the Jews. Consequently, the English people is almost as kaleidoscopic as the English rocks or English weather. The total of nearly 38 millions is unevenly distributed over 51,000 sq. m. England contained two-thirds of the population of the British Isles in 1871 and three-quarters in 1911; the rate of increase per decade has gradually diminished from 134 per thousand, 1861-71, to 105, 1901-1911. In 1801 the population was 8,900,000, and in 1851, 17,900,000.

The Pennine, N. Yorkshire and Cornish moors, and the Cumbrian Mts. are uninhabited; in the in-

habited areas there is a continuous gradation towards definite areas of concentration. Roughly, in a belt of country stretching from Weymouth across Salisbury Plain and the Clay Vale to near Peterborough, past Lincoln and Gainsborough to York and the N. half of the plain of the Tees, the population is least dense. E. of this belt there is approximately a steady increase towards the London area. W. of it there are several foci of population. Bristol, the Black Country, the Potteries, the inverted sickle of S.E. Lancashire, and the W. Riding with the continuation to Derby and Nottingham, the Durham district from Darlington to Newcastle—all these are crowded, and the population gradually thins out away from these centres.

#### Varying Areas of Population

A closer examination of details indicates that the areas of dense population such as the London district include nuclei of very dense population grading off to areas of relatively few inhabitants. Consider the area composed of the counties of Cheshire, Derbyshire, Nottingham, and the N. half of Staffordshire. In 1801 more than half the area had fewer people than 128 per sq. m. In the W. half Chester, Nantwich, Northwich, Macclesfield, Stoke, Stockport, and Altrincham were small urban areas with at least 1,920 people per sq. m. In the E., Derby, Nottingham, Newark, Retford, and Chesterfield were similar urban areas. By 1851 the areas of sparse population had grown smaller and the urban areas exceeding 1,920 per sq. m. were more numerous along certain definite lines, from Birkenhead to Stockport along the Mersey, from Stoke N. to Macclesfield, from Derby N. to Chesterfield; the Nottingham nucleus was larger, but those of Chester, Retford, and Newark were unchanged.

By 1901 the areas of sparse population were nearly as large as in 1801; the rural areas were being depopulated. The urban nuclei, already developed in 1851, had be-



England. Isothermic map, in which points recording the same temperature at a given time are joined by lines

come larger except at Newark. New nuclei had grown along the lines already noted, but the greatest change occurred near Nottingham, where a small urban area had expanded to make almost a complete ring something like 5 m. wide. Throughout two-thirds of the area the population was less numerous in 1901 than a century earlier; in parts there had been an almost continuous decline, elsewhere there had been growth until 1841 and subsequent decline. The urban areas already specified had multiplied their numbers by from 4 to 10 times. Near Birkenhead, round Stoke, in a belt of country from Nottingham to Chesterfield, there occurred exceptional growth.

#### General Conclusions

An inquiry into the circumstances attendant upon these changes yielded the following conclusions. The purely farming areas either absolutely declined in numbers or increased by little more than 50 p.c. In the lead-mining districts the population was almost stationary until the mines failed, when it declined absolutely. In the colliery districts the population increased approximately eightfold. In the salt-mining areas of Cheshire the people increased steadily. In the districts where cotton factories were established growth in population was rapid, but the failure of factories established in unsuitable localities during the boom caused a decline. Results may be summarised thus: the industrial development of the area

attracted the people from the farms and also drew to the urban nuclei large numbers from other parts of England. Similar conclusions may be drawn from an investigation of the population of the West Riding.

The above is a general commentary on the period since the industrial revolution. Modifications have occurred in the 20th century, the depression in northern industries having induced a southward trend of the population, although the 1931 census showed in the N. as well as in the S. a strong concentration in huge industrial towns at the expense of smaller urban areas. Decentralisation of industry for safety in war time caused further shifts of population. A list of the largest English towns, with the number of inhabitants in 1931 and an estimate for 1945, is shown in the accompanying table. These fall into three geographical classes: manufacturing towns on or near the coalfields of the N. and Midlands; seaports, harbours, and

seaside resorts; dormitory towns near London. Norwich is the only place exceeding 100,000 inhabitants outside these groups. Other towns may be devoted to a specialised industry, *e.g.* Burton-on-Trent; of historic, ecclesiastical, or educational importance, *e.g.* York, Winchester, Canterbury, Oxford, Cambridge; transport centres, *e.g.* Crewe, Swindon; catering for holiday makers, invalids, and retired folk, *e.g.* Bath, Buxton, Harrogate, Scarborough; or show places like Stratford-on-Avon.

**INDUSTRIES.** Though England grows wheat, oats, and barley, and raises cattle and sheep, these products supply only a fraction of the cereals and meat required by the inhabitants, with the result that England is proportionally the greatest food importing country in the world. The wheat is grown chiefly N. of the Thames, and E. of a line drawn from London to Goole. Oats thrive in the lowlands. Large county yields are in the E. and Cheshire. Barley is grown in dry Norfolk, Suffolk, and Lincoln; the dryness of the harvest improves malting quality. Beet sugar, especially in the E., was introduced comparatively late.

Cattle are most numerous in the W. lowlands, extending from the plains round Morecambe Bay in a wide sweep along the Severn valley into the Cornish peninsula, where the rainfall exceeds 60 ins. annually, and the clays and alluvial flats yield rich meadow grass. The great centres of population have brought into existence small farmers with small herds of milkers on poor grass land. In Cheshire the dairymen supply the cotton towns with milk, and make cheese. Derbyshire and Leicestershire produce Stilton cheese. Cornwall is rich in cattle, the milk being made into butter and clotted cream. In Devon the cattle are likewise reared for their milk but also for the butcher.

As to sheep, the short pasture and dryness of the chalk hills of Kent, Wiltshire, Dorset, Lincolnshire, and the East Riding are specially favourable. The hill slopes of Shropshire, Hereford, Monmouth, Northumberland, and Cumberland support other flocks.

To indicate the effect of climate and locality on the farmer's work, four counties may be compared: Essex, dry and near London; Lincolnshire, equally dry but distant from dense areas of population; Cheshire, wet and near populous S.E. Lancashire; Devon,

wet and with few towns. Essex has an exceptional area under wheat; its minor crops are beans, peas, potatoes; glasshouses supply grapes, tomatoes, etc., to London; there are seed and fruit farms; rose culture is important; the cattle, below average in number, supply milk to London. Lincolnshire has a large acreage under barley, and grows peas, beans, potatoes, and other roots; Lincoln shorthorns are good milkers and Lincoln sheep are exported for breeding. The west has a relative excess of permanent pasture. Cheshire cattle are chiefly dairy cows, its cheese is famous, and it grows potatoes and root crops. The wheat acreage of Devon is remarkably low, while fruit is abundant, sheep are in excess of the average, and cream is celebrated.

The chief English fishing towns are on the E. coast, Grimsby, Yarmouth, and Lowestoft accounting for most of the catch on this coast, which amounts to three-quarters of the English total. Newlyn is the chief fishing centre on the S. coast, and St. Ives and Fleetwood on the W. The main catch in the North Sea is herring, in the Channel, mackerel and pilchard.

#### Coal and Other Minerals

Coal is the chief mineral of England, which in 1914 yielded a fifth of the world's output, employing a million workers. Not only carboniferous rocks composed the coalfields, for those of York, Derby, and Nottingham have an indefinite boundary under the newer rocks to the E. of the carboniferous series; thus coal may be found at greater depths on the E. margins. Iron came from the coalfields, where the ore was found between beds of coal, and in Cleveland and Furness there are large deposits of haematite ore.

Lead-mining, located chiefly in Derbyshire, has been declining for many years. Cornwall produces tin. Zinc in Cumberland, manganese in Cornwall and Devon, and tungsten in Cornwall are minerals of minor importance. The most important non-metallic mineral is salt, found chiefly in the Nantwich district, also in Lancashire, Worcestershire, and Durham.

The most important English manufactures are textiles. Cottons are focused on Manchester; the chief districts are Blackburn, Oldham, Bolton, Stockport, Preston, and Rochdale. Woollens are chiefly made in the West Riding, with Bradford as a technical and Leeds as a marketing centre, the other

	Pop. 1931	Est. civilian pop. Sept., 1945
London .. .. .	4,397,003	—
(Greater London) ..	8,203,942	—
Birmingham ..	1,002,603	1,001,600
Liverpool .. ..	855,688	680,500
Manchester .. ..	766,378	624,300
Sheffield .. ..	511,757	475,700
Leeds .. .. .	482,809	449,800
Bristol .. .. .	397,012	416,500
Hull .. .. .	313,544	249,500
Bradford .. ..	298,041	261,700
West Ham .. ..	294,278	142,700
Newcastle-on-Tyne	283,156	264,370
Stoke-on-Trent ..	276,689	250,200
Nottingham .. ..	268,801	264,400
Portsmouth .. ..	252,421	186,900
Leicester .. ..	239,169	254,100
Croydon .. .. .	233,032	211,400
Salford .. .. .	223,438	157,100
Plymouth .. ..	208,182	161,800
Sunderland .. ..	185,824	165,500
Willesden .. ..	184,434	153,720
Bolton .. .. .	177,250	153,200
Southampton ..	176,007	146,300
Coventry .. ..	167,083	221,800
Tottenham .. ..	157,772	113,580
Birkenhead .. ..	147,903	122,200
Brighton .. ..	147,427	133,400
Derby .. .. .	142,403	131,500
East Ham .. ..	142,394	100,100
Oldham .. .. .	140,314	110,700
Middlesbrough ..	138,274	128,500
Wolverhampton ..	133,212	146,000
Walthamstow ..	132,972	106,900
Iford .. .. .	131,061	158,050
Leyton .. .. .	128,313	91,550
Norwich .. .. .	126,236	103,800
Stockport .. ..	125,490	129,100
Blackburn .. ..	122,697	101,300
Gateshead .. ..	122,447	105,700
Southend .. ..	120,115	115,100
Preston .. .. .	119,001	107,500
Ealing .. .. .	117,707	163,650
Bournemouth ..	116,803	127,400
Hendon .. .. .	115,682	134,500
Huddersfield ..	113,475	114,400
South Shields ..	113,455	94,210
St. Helens .. ..	106,789	99,260
Walsall .. .. .	103,059	102,200
Blackpool .. ..	101,553	142,800



chief districts being Huddersfield and Halifax. The manufacture of woollens extends W. to Rochdale, that of cottons E. to Halifax and Bradford. Silk goods are made over a wider area and on a smaller scale, the main centres being Bradford, Stockport, Halifax, Stoke, Birmingham, and London. Leicester, Nottingham, and Derby make lace and both cotton and woollen hosiery. The distribution of the textile industry is largely controlled by the S. Pennine coal-fields.

Because England took the lead in manufacturing on a large scale, her manufactures of iron and steel were for a long time more important in rly. construction and shipbuilding than those of any other country. Smelting operations are usually carried out near the mines, especially in Cleveland and the Black Country. Pig iron is made to the extent of about 7,000,000 tons annually: forge and foundry, Bessemer, haematite, and basic; for these purposes iron ore is imported chiefly to Middlesbrough to supplement local supplies. Steel is made chiefly by the open hearth process.

Sheffield steel and Birmingham hardware are world famous.

The chief shipbuilding district in normal times has been between the Tees and the Tyne. Shale and crude oil are produced in the North. Birmingham, Wolverhampton, and Coventry have been versatile in their products. Other manufactures are specifically localised. The Potteries on the N. Staffordshire coalfield use local clay and coal for making crockery and earthenware. Northampton and Leicester are centres for boot and shoe manufacture. Chemicals, alkali, and soaps are made chiefly near the Mersey. Steam-driven flour mills are located at the wheat-importing ports, London, Hull, etc. Burton beer, Leeds ready-made clothing, Bristol tobacco, Reading biscuits, may be named.

COMMUNICATIONS. The English railways radiate from London. In 1923 four great groups were formed, the object being the economy resulting from joint management and administration, and elimination of losses due to competition. The groups were as follows: (1)

Southern Railway; (2) Great Western; (3) London, Midland, and Scottish; (4) London and North Eastern. These four groups formed the basis of the five English regions of British Railways that came into being after the nationalisation of the railways in 1948. The five regions are: (1) Southern region; (2) Western region; (3) London Midland region; (4) Eastern region; (5) North Eastern region. From the 1920s there was extensive electrification of suburban and S.R. lines.

English barge canals (see plate facing p. 1704) have been neglected through rly. competition. The only ship canal of importance has made Manchester the fourth port of the country and brought ocean steamers some 30 m. inland, almost to the doors of the cotton factories.

The main roads radiate from London to all points of the compass; e.g. A 1 (ministry of Transport classification) to Edinburgh; A 2 to Dover; A 3 to Portsmouth; A 4 to Bath; A 5 to Holyhead; A 6 to Carlisle. Two great routes do not touch London; from Sheffield through Birmingham, Gloucester, Bristol, and Exeter to Land's End, and from Chester through Shrewsbury and Hereford to Gloucester.

Regular internal air services operate between England and Scotland, Wales, the Isle of Man, N. Ireland, the Channel Islands, and the Scilly Isles.

COMMERCE. England is still among the greatest markets in the world. The need to supply the population has brought about cold storage for mutton and beef, perishable fruits, etc., and has caused great developments in canning, drying, or preserving foodstuffs. Wheat is harvested, and fruits are picked somewhere in the world every week, and consequently the world can send to England a continuous stream of foodstuffs; the products of the S. hemisphere, wheat, mutton, beef, butter, fruits, etc., are at their best when the supplies of the N. begin to fail. In addition to these supplements to home supplies, tea, coffee, rice, etc., are imported. But England is a market for raw materials as well as foodstuffs. She buys the specialities of other lands, and partly pays for these imports by the services of merchant shipping, of the technical experts lent to other lands, and by the export of coal and manufactures.

London and Liverpool rank among the greatest seaports of the world. They are approximately



England. Map showing the principal railway routes of England and Wales

equal in total value of trade in normal times, but London has an excess of imports, while at Liverpool exports and imports balance. Hull, Manchester, Southampton, Newcastle-upon-Tyne, Grimsby, Goole, Bristol, Harwich, Newhaven, Dover, and Folkestone are other ports.

**CONSTITUTION AND GOVERNMENT.** The constitution of England has been extended to apply to the United Kingdom since 1707 and with varying degrees of alteration to Northern Ireland, Eire, the dominions and colonial possessions. It is democratic, but that is probably the last way in which it would be described by a casual observer paying more attention to forms than realities. That framework of government which in the Middle Ages gave it an oligarchical tinge and under the Tudors made it almost a dictatorship still in theory remains unchanged. During all these periods England has had a legislature consisting of the sovereign and two houses of parliament, and the sovereign has been the source of executive power. Great changes there have been; usually they have been gradual, but even when more violent, as in the revolution of 1688-89, the framework has been untouched except for the break during the interregnum, whose very name indicates impermanence. The constitution has never been completely recast, for England has had no true revolutions.

#### **Influence of Custom and Convention**

Many important changes are due not to the alterations in the law but to the growth of customs and conventions. There is no law which says that parliament must meet once a year; nor to prevent the crown from refusing its assent to any bill passed by the two houses of parliament; yet parliament does meet every year and no sovereign has refused assent to a bill since 1707. Most royal powers are actually exercised in the name of the sovereign by ministers answerable to the house of commons. Conventions do often depend indirectly on some law. If parliament did not meet every year it would be impossible to carry on the work of government, as no money would be available since taxation must be imposed each year by Act of Parliament. No army could be maintained, for the Army Act authorising its maintenance has to be passed each year.

The English constitution is flexible, not rigid like that of the United States, contained in

one formal document capable of alteration only by special procedure. There are Acts of Parliament and constitutional documents of great importance—*Magna Carta*, 1215; *Petition of Rights* 1628; *Bill of Rights*, 1689; *Act of Settlement*, 1701; but these are on no different footing from other Acts. It would be open to parliament in one day to pass an act repealing every one of them, using procedure no different from that employed to repeal any other Act.

#### **Relation of Executive and Legislature**

Another characteristic is that the executive is responsible to the legislature. This means in practice today that the government is formed from members of the political party which commands a majority in the house of commons, and can hold office only so long as it is supported by that house. In the U.S.A. the executive is not responsible to the legislature. The president is head of the executive and is elected for four years. It happened as a result of the congressional elections in 1946 that a congress with a strong Republican majority was returned although President Truman was a Democrat. A similar situation arising after the First Great War, when a Democrat president, Wilson, was in office with a Republican congress, was largely responsible for the American refusal to enter the League of Nations. Under the English constitution it is impossible for such a situation to arise.

A third English characteristic is the Rule of Law. The essence of this is the absence of any arbitrary power, and it is the main basis of English freedom. The Rule of Law ensures that the executive has no arbitrary power over a citizen, for he can be punished for anything he has done only if an impartial court sitting in public decides that he has infringed the law. It is vital to the operation of this Rule of Law that the judicature should be independent of the executive. A judge can therefore be removed from office by the crown only on a joint address of both houses of parliament; and his salary is paid out of the Consolidated Fund, i.e. is fixed by Act of Parliament and paid automatically each year, not coming before parliament annually as do the salaries of most public officials. Thus a judge who has to decide a case in which the executive is concerned need not fear to decide against the executive.

Montesquieu from a study of the English constitution derived the

doctrine that its effectiveness was due to the separation of powers, i.e. to the legislative, judicial, and executive powers being independent of one another. This doctrine had important results in the constitution of the U.S.A. which was based on it; but has never been strictly applicable to the English constitution. Legislature, executive, and judiciary are not completely separate. In particular, the executive has always exercised some legislative and judicial powers. These powers growing in recent years, their wide extent has been declared dangerous to freedom by many eminent lawyers, e.g. Lord Chief Justice Hewart in *The New Despotism*. In spite of this opposition, today vast numbers of laws are made not by parliament but by some government department under powers delegated to it, and many decisions as to rights of individuals are made not by the courts but by some official of a government department. A good example is afforded by the *National Insurance (Industrial Injuries) Act*, 1946, under which questions whether an employed person has been injured by some accident "arising out of and in the course of his employment" are to be decided in private by an official of the ministry of National Insurance, and not, as hitherto, in public by a court under the *Workmen's Compensation Acts*. Other examples of the exercise of legislative powers by the executive were afforded by thousands of regulations made during the Second Great War.

#### **Government by the Commons**

The legislature consists of king, lords, and commons; but in practice power lies with the commons and inside that house the party which enjoys a majority and forms the government can usually bring about the passing of such legislation as it pleases. The checks on the power of the government are practical rather than legal. Ministers must have some regard to public opinion as voiced by the press and representative bodies like chambers of commerce. To ignore it would lead to breaches within the party, a defeat of the government, and the holding of a general election. A prominent feature both in the house of commons and in the constituencies is the party system under which members are elected not for their individual qualities or policies but because they belong to one or other of the political parties. Likewise in the house members are expected

to vote in support of the party to which they belong.

Since 1911 the supremacy of the house of commons has been put on a legal basis, for the Parliament Act of that year provided that any bill (except a money bill or a bill extending the duration of parliament beyond five years) if passed by the commons in three successive sessions would become law on receiving the royal assent even though it was rejected by the lords. Money bills, *i.e.* bills relating to taxation, on receiving the royal assent become law if passed once by the commons, though rejected by the lords.

The executive consists of ministers of the crown with the prime minister at their head. The most important ministers form the cabinet, all normally of one political party, unless a coalition of parties is formed in time of crisis. In practice the cabinet decides what legislation shall be proposed in the house of commons. Occasionally Acts are passed which have been introduced by private members, *e.g.* A. P. Herbert's Matrimonial Causes Act, 1937. Each department of state is under the charge of a minister, although occasionally ministers whose presence and advice are desired are appointed without portfolio. Ministers must defend their departments in parliament. The departments are manned by permanent civil servants.

#### **Functions of the House of Lords**

The judiciary in civil matters consists of the house of lords, the supreme court of judicature, and county courts. The house of lords hears appeals from the court of appeal and when acting in this capacity does not consist of all the peers who take part in its proceedings when it is acting as part of the legislature. Legally every peer is entitled to attend, but for 100 years there has been a convention that on the hearing of an appeal no peer shall take part except the lord chancellor, the lords of appeal in ordinary, who are judges appointed for life, and peers who hold or have held high judicial office. The supreme court of judicature consists of the court of appeal and the high court of justice. The court of appeal hears appeals from county courts and from the three divisions of the high court: king's bench division, chancery division, and probate, divorce, and admiralty division. Judges of the king's bench division go round the country on circuit hearing civil and criminal cases.

Justice is administered locally in county courts which hear cases involving less than a certain amount of money.

Criminal cases are heard by benches of several lay justices in petty sessions or by one magistrate who is a lawyer. More serious cases are sent for trial before a recorder in quarter sessions or before judges of the king's bench division at assizes. In London the central criminal court (Old Bailey) takes the place of an assize court. An appeal lies from petty sessions to quarter sessions or on a point of law to the king's bench division; from quarter sessions, assizes, and the Old Bailey to the court of criminal appeal; thence in special cases to the house of lords.

Before the Statute of Westminster, 1931, no dominion legislation was valid if it was repugnant to the rules of English common law or any English statute. This continued to apply to colonial legislation.

**LOCAL GOVERNMENT.** Under the supreme control of parliament, the people of England enjoy a large measure of local government. Each unit is a democracy working through the representative system. The men and women of county, borough, district, and parish elect certain men and women to form a council which manages such matters as parliament has entrusted to it. In many, but not all, of these councils there is an element—the aldermen—not directly elected, but chosen by the elected councillors.

The main division, as far as local government areas are concerned, is the venerable one between county and borough, although the demarcation is by no means complete. The forty older counties (London is an exceptional case) of England have had some sort of local government for a thousand years, but the existing system dates from the Local Government Act of 1888. The officials who until that time governed the counties—lord-lieutenant, high sheriff, and magistrates in quarter sessions—retain their positions, but their powers passed almost entirely to elected bodies called county councils.

These councils set up in 1888 do not correspond altogether to the counties as they existed before. The three historic divisions of Yorkshire became the East, North, and West Ridings; Lincolnshire was divided into Holland, Kesteven, and Lindsey; Suffolk and Sussex each into East and West; from Cambridgeshire the Isle of

Ely, from Northamptonshire the Soke of Peterborough, from Hampshire the Isle of Wight, were separated; a new county of London was created from parts of Surrey, Middlesex, and Kent; each new division with its council. The councils hold elections every third year, and their powers over education, police, public health, and other matters are laid down in the Acts of 1888 and following years. Towards expenses they receive large sums from the government, but the balance they raise by a rate on all property within the county.

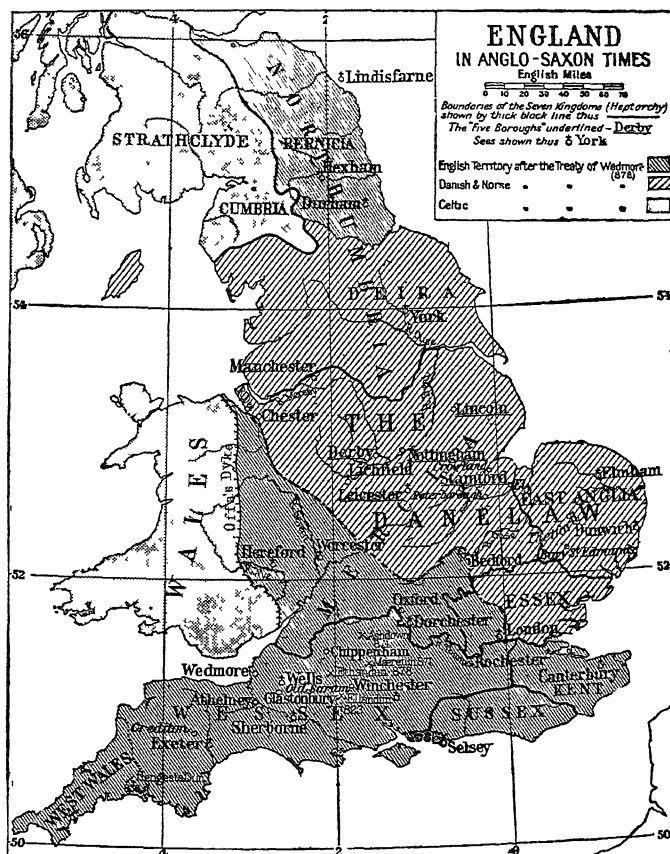
The Act of 1888 affected also the boroughs. It created county boroughs, placing them entirely outside the authority of the county councils, and thus established a system by which every place is in either county proper or county borough, and consequently every voter is represented in one or other council.

Excluding the county boroughs, every part of England is either a borough, an urban district, or a rural district; it is also part of an administrative county and is represented in its council.

#### **What Constitutes a Borough**

The borough is a place which has received a charter of incorporation. Its local government is regulated by the Municipal Corporation Act of 1835 and an amending Act of 1882. It is governed by a mayor and council consisting of aldermen and councillors. The councillors are elected for three years, one-third of them retiring every year, and they choose the aldermen, who form one-third of their number. A special class is formed by 28 into which the county of London is divided. They are subordinate to the London County Council; their powers are different from those of ordinary boroughs; although of considerable size, they are not county boroughs.

The country outside London and outside the provincial boroughs is divided into urban and rural districts, called into existence by an Act of 1894. Urban districts are the thickly populated areas which have not yet become boroughs; rural districts are the country areas. The division is not absolutely rigid, and some populous areas remain rural districts. Each is governed by a council, elected for three years. The head is called chairman, not mayor, and there are no aldermen. These councils work in general under the supervision of the county council.



England. Map of the country under the Anglo-Saxons, showing the divisions of the heptarchy and the territories occupied by the various peoples

**HISTORY.** The departure of the Roman legions in A.D. 407 left Britain without any controlling government, but the old system of local principalities soon revived. The N. however, was open to attack by the Picts and Scots, the W. coast to invasions from Ireland, and the E. to raiders from the European coast. About the middle of the 5th century, Jutes from Denmark made a settlement in Kent which became permanent. During the next hundred years, Angles and Saxons sent fresh hordes which established themselves on the E. and S. coasts, pushing inland till they had mastered the country E. of a line running roughly from Dunbar to Portsmouth.

Between 560 and 613 the newcomers overran the midlands, pushing the Britons further to the W., and thrust wedges up to the sea both on the N. and on the S. of Wales. In 597 Christianity was introduced into Kent. Thence it spread N., where through the greater part of the 7th century Northumbria was the most power-

ful of the English states. In the 8th century the supremacy passed to Mercia, and in the 9th to Wessex.

The second half of the century saw a desperate struggle between the English and a new host of invaders, the Danes, who established their mastery over half the island, but were forced back by Alfred the Great. In the 10th century Edward the Elder and his sons subjugated the Danes, and the kings of Wessex became kings of England.

#### The Battle of Hastings

But the subjugation of the Celts on the Cumbrian hills and the Devon moors was slow and incomplete; while in Wales they successfully preserved their independence. In the 11th century Sweyn, king of Denmark, and his son Canute established a brief Danish dynasty; but on the death of the last of Canute's sons, Edward the Confessor was recalled to the throne of England. When he died in Jan., 1066, the English elected Harold, Godwin's son, as king, but the crown was claimed by William, duke of Normandy, who shattered Harold's

army at Hastings, and was crowned in London on Christmas Day, 1066.

During the next six years risings in the N. and W. compelled William to subdue the whole country by merciless force, and provided him with an excuse for confiscating much of the land and distributing it among his Norman followers, though a substantial number of small estates remained in English hands. Theoretically, the Norman king reigned as the legitimate successor of the Wessex kings, by the same laws, legislating with assent of the *Witan*, the assembly of magnates, occasionally expanded into the common assembly of such freeholders as might choose to attend. Actually the conquest effected a revolution, because all the magnates and half the barons or lesser landholders were now Norman instead of English; the law was interpreted by them in their own interests and they reduced many of their own tenants to serfdom or villeinage.

#### Rule of the Normans

William and his two sons, William Rufus and Henry I, were powerful monarchs who utterly crushed the attempts of the new baronage to ignore or defy the authority of the crown. They called to their support the English population, who were infinitely more hostile to the local Norman tyrants than to the crown, though William II was himself a tyrant. After a reign of 35 years, Henry was succeeded by his nephew Stephen, whose claim to the crown was disputed by Henry's daughter, Matilda or Maud. The reign was a long horror of anarchy; the strife for the crown wrought less havoc than the private wars waged against each other by the barons, who pillaged, robbed, and murdered on all sides. The evil days were brought to an end on the death of Stephen in 1154 by the accession of Henry II, grandson of Henry I, the first Plantagenet.

Henry, already by inheritance or by marriage in possession of half France, did great work in the reorganization of the government of England. The baronage on the whole cooperated loyally with the king in the work. Revenues were collected, and the higher courts of justice were conducted by the king's officers, removable at his pleasure; the practical freedom of appeal to the royal courts against local injustice was greatly extended. The old system by which the king's officers could call up the freemen of the shire in arms was revived, counterbalancing the feudal right of every baron to call upon his own tenants for military service, while incidentally, through the practice of

obtaining the formal approval of the Great Council for the measures upon which the king had decided, the idea developed that the Council had a right to be consulted. In the course of the reign a Norman baronage was planted in Ireland, and, through the formal homage of the Irish chiefs, the island was annexed to the English crown.

Henry's elder son, Richard I, left the governance of the kingdom to justiciars, while he himself was engaged on crusade or in his French dominions. Public spirit and respect for law developed, so that in the reign of Richard's brother, John, who repeatedly overrode the law for his own ends, the barons combined to wring from him Magna Carta. Incidentally, also, John's reign brought about the severance of Normandy and most of the Plantagenet possessions in France from the English crown, making the baronage of England an English baronage with exclusively English interests.

In spite of Magna Carta, John's son, Henry III, in the course of a reign of 56 years, persistently attempted arbitrary and illegal methods of government, choosing for his ministers his own or his wife's foreign kinsmen in place of the English nobles, who regarded such offices as due to themselves of right. At length the baronial party combined under the leadership of Simon de Montfort, in effect to transfer the supreme control from the hands of the king to baronial committees. Faction among the barons led to the fall of Montfort in 1265.

#### Henry III and Parliament

But he had championed two great principles—first, that the sanctity of the law was to be maintained as sternly on behalf of the commons as on behalf of the barons; and, secondly, that the government should rest upon the assent of the realm expressed through the common council of the realm, which was now acquiring the name of Parliament. The practice of summoning thereto elected representatives of the freeholders had been developing all through the century; Montfort in 1265 established the principle of calling also representatives elected by the boroughs. Montfort himself failed, but his cause had triumphed. Acting as champion of the law, he, like Cromwell four centuries after him, found himself compelled to ride roughshod over the law, to adopt unconstitutional methods of asserting constitutional principles. His mantle fell upon the man who had overthrown him, who, as Edward I, made the law supreme.

The reign of Edward I is a crucial epoch in the history of England. In it the English nation, finally consolidated and unified, realized that the common interests of all classes were of more importance to each than the antagonistic interests of individual classes and groups; that the law which should be directed to the good of all should be uniform and fixed. It was the great era of definition, regulation, systematisation. It declared, though not finally, the powers of the crown for raising revenue, the jurisdictions of the baronage, the rights of the national assembly to consultation. It established the law of inheritance, and the subjection of the clergy to the civil law. Above all, it defined for 500 years the constitution of the national assembly itself; this being in the Model Parliament of 1295.

#### Yeomen and Serfs

But while Edward succeeded in unifying England and shaping the structure of the constitution upon foundations which had already been laid, he was not equally successful in accomplishing his desire of extending the unification to the whole island. Hard fought campaigns in Wales brought her into the English system; the attempt to absorb Scotland upon pretexts of feudal law forced her into temporary and incomplete subjection tempered by persistent insurrection, and finally issued in complete failure during the reign of his son and successor, Edward II.

During the 13th century England had become definitely the Merrie England of the ballads. The old hostility of Norman and Englishman had disappeared. The rural population had fallen into the two divisions of those who had succeeded in preserving their legal freedom, the yeomanry, and those who had been thrust into serfdom or villeinage which bound them to the soil on which they were born.

But already the practice of commuting services for payment, and correspondingly of hiring service for wages was becoming widespread; the lot even of the villein was not generally a very hard one. The larger towns were flourishing commercial centres, although being still to a great extent agricultural communities which had purchased rights of self-government and immunity from the jurisdiction of overlords from the king. These rights were conveyed to them by charter. There was already an extensive foreign trade; cloths, wines, and many other European products being imported, while the leading English exports were

wool and hides, and rural products of all kinds.

An incompetent king, Edward II, succeeded Edward I. There was a recrudescence of the struggle between the crown and nobles, who looked upon themselves as the champions of constitutionalism, but were in fact endeavouring to concentrate political power in the hands of a narrow oligarchy. The civil strife, whether latent or active, caused that complete neglect of the Scottish question which enabled Robert Bruce gradually to clear Scotland of the English garrison, and to recover an unqualified independence by inflicting upon the English the decisive defeat of Bannockburn in 1314.

In 1327 Edward II was deposed and murdered by his French wife, Isabella, and her paramour, Roger Mortimer, while the crown was set on the head of Edward III. Three years later the king, then eighteen years of age, effected a *coup d'état* which ended the intolerable government of the regency, and executed Mortimer. All this time Plantagenets had retained possession in France of their hereditary fiefs of Guienne and Gascony, which successive French kings on various pretexts had sought to filch from them. This process was continued by Philip VI. On his accession, a fairly tenable claim to France had been put forward on behalf of Edward of England through his mother, the sister of the last king of France; but France had decided in favour of the Valois succession, and of the principle that there was no right of inheritance to the French crown by or through a female.

#### The Hundred Years' War

The strife over Guienne and Gascony was a standing cause of quarrel; the claim to the French throne provided another pretext; while a serious subject of contention was the attempt to restrict the valuable trade between England and Flanders which was a fief of the French crown. On account of this the Flemings were ready to take part with Edward if he assumed the character of their lawful suzerain by asserting his claim to the French crown, and on this combination of pretexts the Hundred Years' War between France and England was embarked upon in 1337.

The English longbow and the clothyard shaft had first been brought into effective play by Edward I in his Scottish wars. The Scots and Flemings had recently proved the power of

spearman to defy the shock of the charge of mailed cavalry. The two principles were combined by Edward III and his son, the Black Prince. The English archery and dismounted men-at-arms shattered superior forces at the battles of Crécy (1346) and Poitiers (1356). King Edward captured Calais in 1347, to remain as a gateway to France for 200 years. In 1360 he forced on the French the treaty of Brétigny, which conceded to him a quarter of France in full sovereignty.

Twelve years later all that had been won was practically lost; England retained only a precarious hold upon a part of Guienne and Gascony, as well as Calais. The war was enormously costly, and its costliness developed the power of the Parliament, which was now strong enough to forbid the imposition of taxes, other than those formally sanctioned in the reign of Edward I, except by its own vote. The power of the purse passed definitely into the hands of Parliament, and with it a certain limited control of policy; the royal revenues were insufficient, at least for war programmes, unless supplemented by the land and property taxes, known as tenths and fifteenths, and afterwards as subsidies, which the lords and commons voted.

#### The Black Death

The general prosperity was checked by the tremendous visitation of the Black Death in 1348. A third of the rural population is said to have perished; for lack of labour the harvest was left to rot and the fields were left untilled, while famine followed upon the plague. The landholders sought to revive all their old powers of enforcing service; the peasantry refused to work except at very high wages, and the government stepped in with the Statute of Labourers, vainly attempting to fix a standard wage. A class animosity was born, quite different from the bygone hostility between the English occupants of the soil and their Norman conquerors. This bore fruit in the peasant revolt of 1381. The revolt was crushed, but was not followed by any enactments for the removal of grievances; the system of villeinage, forced agricultural services, and restrictions upon rural wages remained.

Edward III in the pursuit of revenue had grasped the advantages of encouraging and organizing trade under state supervision. The export of staple goods, wool, hides, etc., was restricted to the Company of the Merchants of the

Staple, trading only in authorised localities, known as the staple towns; the import of manufactured goods was mainly in the hands of foreign trading societies, notably the German Hanse; both groups paid for their privileges and enjoyed powers of regulating the traffic. But at the same time the process of manufacture in England itself advanced greatly, and English cloth goods began to compete in foreign markets as well as in England. Although a gloomy picture of rural life is presented in Langland's *Vision of Piers Plowman*, the pages of Geoffrey Chaucer convey an altogether convincing impression of an England materially prosperous, genial, and light-hearted, and full of a robust kindness.

#### Rule of the Lancastrians

Richard II (1377-99) found himself much in the hands of a faction of the nobility, who, however, could no longer usurp the functions now acknowledged to lie in Parliament. Soon after coming of age, he succeeded in recovering the royal authority, but though he ruled well for several years, he was unhappily nursing vindictive schemes and plans of arbitrary rule. He turned suddenly upon the nobles who had once held him in restraint, put some of them to death, banished others, and imagined himself undisputed master of the kingdom. But in 1399 his banished cousin, Henry of Lancaster, returned to England. The discontented nobles rallied to Henry's standard, Richard was deserted and brought a prisoner to London, a parliament was called, Richard was compelled to abdicate, and the parliament declared Henry king of England by lawful descent.

With Henry IV began the rule of the Lancastrian branch of the house of Plantagenet. Raised to the throne of the cousin who was done to death soon afterwards, while yet another cousin, the child Edmund Mortimer, had a better claim than his own to the succession as descending from an elder son of Edward III, Henry knew that he ruled by a parliamentary title. Parliament knew it, too, and the result was that the Lancastrian kings were very much at the mercy of their parliaments. Also, as clerical influences had been vigorously applied on Henry's behalf, the house of Lancaster was compelled to conciliate the clergy. Hence Henry was led to a rigorous suppression of the Lollards. The teaching of Wycliffe, about the end of the reign of Edward III, had attained considerable popularity during the reign of Richard II in a

country where the anti-clerical sentiment was always strong, until it began to be applied as a sort of communistic propaganda; but burning at the stake as the punishment for the unrepentant heretics first became the law of the land in the reign of Henry IV.

That monarch's uneasy rule of fourteen years was followed by the brilliant reign of his son Henry V. In the anarchy which had overtaken the French kingdom, Henry found occasion for a preposterous revival of the claim of Edward III to the French crown. In 1415 he invaded France, captured Harfleur, and at the head of no more than 8,000 men won the victory of Agincourt. Three years later he returned to France and set about a systematic and organized conquest. The factions of French politics brought over to his side the powerful duke of Burgundy and the French queen, when all Normandy was already in his possession. The king of France was compelled to acknowledge Henry as his heir, while the dauphin Charles and the greater part of France remained defiant. Inch by inch Henry made himself master of N. France, but in 1422 he died, leaving the English crown and the French succession to his infant son, Henry VI, and the government of the country to a council of regency.

#### Loss of Burgundy and Guienne

The resources of England were not equal to a conquest of France. In spite of the abilities of Henry's brother, John, duke of Bedford, the subjugation proceeded slowly, and was stopped altogether by the extraordinary interposition of Joan of Arc. The death of Bedford himself in 1435 was fatal to English ambitions; the defection of Burgundy was still more decisive, and from that time the record of the French war was one of almost continuous defeat; until in 1453 even Guienne was lost, and Calais was the only foothold left to the English in France.

The usurpation of Henry IV and the aggression of Henry V brought their Nemesis. Popular disgust was kindled against the faction who exercised control over the weak, pious Henry VI as being responsible for the disastrous mismanagement of the war and the feeble government at home. The opposition was led by Richard of York, representative of a branch of the descendants of Edward III senior to the house of Lancaster. Richard claimed to be the effective head of the government. The rebellion of Jack Cade in 1450 was not, as is commonly supposed, an



agrarian rising like that of Wat Tyler, but was, primarily at least, a popular protest against the unpopular government. The strife of the factions in high places issued in the War of the Roses.

From 1455 to 1460 war and truce between the parties alternated. It was not until 1460 that Richard startled his own supporters by asserting his own claim to the crown, a claim modified into demand for recognition as the heir, although King Henry had a young son. Richard was killed at the battle of Wakefield, but his son Edward, supported by Warwick, proclaimed himself king, shattered the Lancastrian army at Towton in 1461, and maintained himself on the throne till his death in 1483.

During the first ten years of his reign there were repeated Lancastrian insurrections; the defection of Warwick actually drove Edward IV in flight from the country in 1470; but, returning in the next year, he crushed Warwick and the Lancastrians at the battles of Barnet and Tewkesbury, and for the rest of his reign ruled without fear of any rivals.

On Edward's death his brother, Richard of Gloucester, after an interval of a few weeks usurped the throne of his young nephew Edward V, who was shortly afterwards murdered in the Tower with his brother. The usurper instituted a reign of terror so intolerable that after two years Henry Tudor, earl of Richmond, a descendant of John of Gaunt, though by an illegitimate line, and the acknowledged head of the Lancastrian party, was able to return to England from the exile into which he had retired, to slay Richard III at the battle of Bosworth, and to claim the crown, a title acknowledged by the parliament which he summoned.

#### The Reign of Henry VII

During 25 years the power of the sword had decided who was to be king in England; parliaments had been summoned, but were attended only by partisans of the dominant faction. Each side had attained of treason all the leaders on the other side, put them to death when it could lay hands on them, and redistributed their estates. The old families were almost blotted out, and the new generation of nobles bore names which had hardly been heard of fifty years before. It was the business of Henry VII (1485-1509) to restore peaceful and orderly government, commercial prosperity, and reforms, at least of law. The claws of rebellion were clipped and the royal treasury was simultaneously filled by the systematic process of fines

and confiscations, drastically applied wherever an excuse could be found. Parliament was habitually summoned and treated as the king's responsible partner in all his acts.

Foreign policy was directed to the development of commerce and the acquisition of indemnities for campaigns on which nothing had been spent; commerce itself, on the other hand, was applied as a weapon for making the rulers of France and Burgundy compliant. The king ruled always by forms of law; taxation and legislation were the province of parliament, though a skilful king rarely failed to procure from parliament the powers or the money which he required. Rebellions raised on behalf of pretended members of the house of York, Lambert Simnel and Perkin Warbeck, were suppressed. Henry's marriage to Elizabeth of York put the title of his son to the succession beyond question; the marriage of his daughter Margaret to James IV, king of Scotland, in 1503, placed a Stuart on the English throne as the legitimate monarch a hundred years later. When Henry died in 1509 the house of Tudor was firmly established on the English throne, and the crown with a full treasury enjoyed an almost unprecedented power.

#### The Discovery of America

The reign of Henry VII fell upon that period of transition when the medieval world was passing into the modern. In 1477 the first printing press had been set up in England. The intellectual movement long active in Italy reached England and awakened a new spirit of criticism. Columbus discovered the West Indies, the Cabots from Bristol reached Labrador, the Portuguese sailed across the Indian Ocean to India. Europe was emerging into a new state system. With Henry VII dawns the conception of international relations as being concerned with the preservation of a balance of power among the great states. In the reign of Henry VIII (1509-47) Cardinal Wolsey stands out as the diplomatist who made it his aim to hold the balance between the king of France and the king of Spain, who was at the same time lord of the Netherlands and German emperor—Charles V.

But Henry's international activities were merely an episode. The great feature of the reign was the ecclesiastical revolution which fixed the grip of the state irresistibly upon the church, annexing the greater part of its wealth, and repudiated the authority of the papacy. The instrument of

the revolution, the artificer who designed its methods, was Thomas Cromwell, who, after Wolsey's fall in 1529, won Henry's confidence and retained it till 1540, when he had completed the work, not only of subordinating the church to the crown, but of obtaining for the crown by strictly legal parliamentary process such a latitude of power as it had never before possessed.

#### Edward VI and Mary

When Henry initiated the ecclesiastical revolution with the primary object of getting rid of his wife in order to marry another, he took the nation into partnership and secured parliamentary sanction for everything he did. He, however, procured from it first a weapon for silencing all external opposition in the Treasons Act of 1534, and then a virtually absolute authority for himself, though not for his successors, by the Royal Proclamations Act of 1539. Henry left one young son, whose legitimacy was indisputable, and two older daughters by mothers whose marriages with him had both been pronounced invalid, though before his death it had been formally laid down that the right of succession remained to both children.

While Edward VI was king (1547-53) the government was in the hands of a council controlled first by Edward's uncle, the protector Somerset, and then by John Dudley, earl of Warwick, best known as duke of Northumberland.

Henry's extravagance had depleted the treasury; he had suppressed the monasteries, the only institutions in the country which were officially concerned with the relief of poverty. For more than half a century the peasantry had been ousted from the land, and distress and suffering were widespread.

Both Somerset and Northumberland, from conviction or from policy, actively fostered the religious reformation, and carried out the protestantising of the Church with gross and unseemly violence, though without extreme persecution. The accession, however, of Mary in 1553 was followed by an extreme reaction with the sanction of parliament—under which some 300 persons, including five bishops, were burnt at the stake. The effect of the persecution was not the suppression of heresy, but the development in the popular mind of an intense hostility to Romanism. The general impoverishment and the miserable misgovernment during the two reigns of Edward VI and Mary brought England to such low estate that she was unable to

retain her hold upon Calais, which was retaken by the French in 1558, leaving her without a footing on the Continent for the first time since 1066.

Elizabeth in 1558 found the country in evil case indeed, but with all the elements for a glorious recuperation. An unflinching judgment in the selection of counsellors and instruments, a supreme confidence in the spirit of the nation with which she identified herself, a complete freedom from conscientious scruples, an intuitive perception of the weaknesses of her enemies, a perfect mastery of stage effects, united with an indomitable determination to raise England to the position of the first power in the world, made her the most brilliantly successful of all English monarchs. The national finances were reorganized with a rigid economy which ensured full value for every penny spent.

The question of religion was taken in hand, on the principle of permitting the widest possible latitude of opinion compatible with uniformity in practice, while explicitly requiring the subordination of all authority to that of the state, and rejecting any compromise which implicitly attributed authority to the pope. The enterprise of the seamen who set at naught the Spanish claims to a monopoly of the New World was unofficially encouraged. Nearly thirty years passed before that open rupture with Spain came, but by that time England was ready, and there came the annihilation of the Spanish Armada, in the fight of July 20-August 2, 1588.

#### Period of General Prosperity

A regular government, pursuing a popular policy with conspicuous success and with increasing stability, free from every kind of unsettling capriciousness, encouraged energy and enterprise in every direction. The regulation of trading and apprenticeship, the multiplication of chartered mercantile companies, the gradual readjustment of the rural population to the agrarian upheaval of the first half of the century, and the judicious experiments which culminated in the poor law of 1601, established a general prosperity. The queen ruled, but always with the express assent of her people.

Elizabeth was the last of the offspring of Henry VIII. She was succeeded therefore by the legitimate heir, James VI of Scotland, the great-grandson of Henry's elder sister Margaret. James I (1603-25) came to the throne of England with a title less disputable than that of any monarch since Richard II,

except Henry VIII and Edward VI. By the peculiar cunning which he called kingcraft, he had already acquired for the crown in Scotland a control over the government enjoyed by none of his ancestors since Robert Bruce. James claimed and sometimes tried to exercise the power of overriding the law by divine right; but a wholesome fear of arbitrament by battle always kept him from overstepping the limits of English endurance. He wrought the country up to a high pitch of irritation, destroying utterly the basis of mutual goodwill between the crown and the people, which had in fact been the basis of the apparently despotic authority of the Tudors.

#### Charles's Struggle with Parliament

Charles I (1625-49) reaped the bitter fruits of his father's theories. Elizabeth's parliaments loved her and bore with her caprices. The parliaments of the Stuarts did not love them at all, and were only too ready to discover grounds for quarrelling with the monarch. Charles gave them ground enough by entrusting the direction of policy to his favourite, George Villiers, duke of Buckingham, by standing on what he regarded as his legal rights of raising revenue without sanction of parliament, by overriding the law in the punishment of recalcitrants, and by repressing all latitude of religious doctrine and observance; enforcing his will through the arbitrary powers of the courts of Star Chamber and High Commission.

Charles's parliament, on the other hand, refused supplies until grievances should be removed, asserted the novel claim to a right to the control of religious affairs, and in 1628 compelled the king to accept the Petition of Right, which unfortunately failed of its precise purpose—the accurate definition of the limits of the royal prerogative. Eleven years of arbitrary rule without parliament were ended in 1640 by the arming of Scotland—an independent kingdom to whose king accident had also given the crown of the neighbouring kingdom of England. Scotland found the king's rule too arbitrary; the king could not suppress his Scottish subjects without the aid of English arms; all his expedients had not provided him with the money for an army, and he was obliged to summon the English parliament, and then to dissolve it, and summon it anew.

The Long Parliament, instead of aiding him against the Scots, attainted and beheaded Strafford, impeached Laud, and proceeded to force the king to accept a

series of enactments abolishing the arbitrary courts, and explicitly depriving him of the disputed prerogatives. A *coup d'état*, the attempted arrest of five members on Jan. 4, 1642, failed completely; the king left London, and after several months of futile negotiation, the great Civil War opened in August, 1642.

The struggle was conducted with a decency and humanity which offer a pleasing contrast to the horrors of the Thirty Years' War, then raging on the Continent. After various vicissitudes, the army of the parliament was reorganized by Oliver Cromwell and won the decisive victory of Naseby on June 14, 1645. Charles surrendered to the Scots, who had associated themselves with the cause of parliament, in May, 1646, was by them handed over to the parliament in Feb., 1647, and was carried off into the custody of the army on June 3. From his confinement he intrigued with his own supporters and negotiated with three separate groups—the chiefs of the parliament, the chiefs of the army, and the Scots—each of whom now had different objects in view. The king's attempt to recover his ascendancy by playing them off against each other failed disastrously. His own attempt to escape to France in November, cavalier insurrections, and a Scots invasion in 1648, threw the control into the hands of the victorious army, and determined its chiefs that the king's death was the necessary condition for the restoration of a stable government. An arbitrary court condemned him to death and he was executed on Jan. 30, 1649.

#### The Commonwealth

England was now proclaimed a commonwealth or republic. The Scots recalled the prince who was *de jure* Charles II, but the English Commonwealth could not afford to have the claimant to the throne of England seated on the throne of Scotland. A war with the Scots followed and culminated in Cromwell's crowning victory at Worcester (Sept. 3, 1651), but Charles II made his escape from the country. The remnant or rump of the parliament, which had constituted itself the sovereign body by its own authority, sought to transform itself into a permanent oligarchy, with the result that it was forcibly ejected by Cromwell in April, 1653; and from that time Cromwell, who was made lord protector by the army in December, was virtually the absolute ruler of England. The former champion of parliamentary government found all attempts to work in harmony with the

parliament vain. His government was necessarily arbitrary, but strove at least to be as just as the circumstances permitted, while his vigorous imperial policy, though it helped to raise France to a dangerous height of power, made England feared on the Continent as never before. With Cromwell's death (1658) came chaos. The country was sick of the rule of soldiers and saints, and it was with practically unanimous satisfaction that Charles II was recalled to the throne (1660).

The Restoration meant nothing at all like the triumph of the Stuart conception of monarchy. The country intended parliament to be predominant, and, as far as concerned legislation and taxation, the king found that it was to be neither cajoled nor overridden. But parliament, rendered by the arbitrary Puritan rule of the Commonwealth intensely hostile to Puritanism, which it smote in a series of enactments much more repressive than was at all pleasing to the king, proved no less hostile to Romanism, to the surprise and disappointment of Charles.

Under the mask of frivolity and dissipation, Charles concealed an invincible determination to avoid fighting with parliament but to make himself entirely independent of it by secretly selling himself and the country to the king of France. For 25 years he successfully deceived statesmen, courtiers, politicians, English and foreign, and the king of France himself. On March 28, 1681, with Louis XIV's purchase money in his pocket, he dissolved his last parliament at the moment when its leaders imagined that he was fast in their grip. He had built up a standing army sufficient for his purposes; in the next three years he cancelled and renewed the charters of the boroughs in such a manner that the crown had practically absolute control over their parliamentary elections.

Having no legitimate children, he had secured the succession to his Roman Catholic brother James. His death left James II with all the master cards held but known how to play them skilfully. James did not. The loyalty of the country was turned first into uneasiness and then into grim hostility. When, for the advancement of Romanism, he alienated ardent royalists and fervent churchmen by arbitrarily suspending or overriding the law, men of every party joined in calling to their aid his son-in-law, William of Orange. William landed in Tor

Bay on Nov. 5, 1688. James took to flight, and on Feb. 13, 1689, William and Mary were proclaimed king and queen of England, having accepted the Declaration of Right which laid down what were to be in future the fundamental limitations of the power of the crown—limitations put forward as the historic right of the people. Scotland followed suit and the crowns remained united.

The accession of the stadtholder of Holland, the lifelong enemy of Louis XIV, carried England full into the vortex of international politics. The ascendancy of the English navy, long disputed by Holland, and now for a moment challenged by France, was decisively established and was never again lost save for a moment in 1782. The right of parliament to fix the course of the succession to the throne was established; the state system of finance was reconstructed by the creation of the national debt and the Bank of England. The party system inaugurated by Shaftesbury under Charles II developed steadily. William died on March 8, 1702, at the moment when he had organized the Grand Alliance which was plunging England into the War of the Spanish Succession. He was succeeded by Anne, second daughter of James II, under whom that war was fought out to its issue. But another issue had arisen. Scotland demanded a permanent union with England, upon terms agreeable to herself, threatening in the alternative to name for Scotland another successor to the throne than that of England. On May 1, 1707, the Act of Union came into effect and the history of England as a sovereign state merged into the history of the United Kingdom (*q.v.*).

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**Englefield.** Parish and village of Berkshire, England, 5½ m. W.S.W. of Reading. Here Alfred defeated the Danes in 870.

Englefield Green is a residential district in Surrey, 1½ m. N.W. of Egham at the S. of Cooper's Hill. The cottage on the green was the home of George IV's mistress, Mary Robinson, the actress.

**English Bázár** OR ANGRAZABAD. Town of Bengal, India, in the Malda district. It stands on the right bank of the Mahananda river, 56 m. N. of Murshidabad. The East India Company established a silk factory here, and there were also Dutch and French settlements. The chief trade now is in grain. Pop. 19,000.

**English Channel.** Stretch of water separating the S. shore of England from the N. coast of France. It communicates with the North Sea on the E. and the Atlantic Ocean on the W. Its extreme length from the Strait of Dover to a line drawn between Ushant, in France, and Land's End, in Cornwall, is 280 m. Its width from Dover to Cape Gris-Nez is 21 m., from Land's End to Ushant 110 m. Its widest part is between St. Malo and Lyme Regis, a distance of 145 m. Its maximum depth is 70, its average depth 30 fathoms. In the Strait of Dover is a chalk ridge at a depth of 12 fathoms. The bed of the channel is of coarse gravel. England has a coast line of 392 m., while the French seaboard is 574 m. Many rivers discharge their waters into the Channel, notably the Seine. The chief islands are the Isle of Wight and the Channel Islands. Fishing is carried on, particularly for mackerel and pilchard. *See* Channel Swimming, Channel Tunnel.

**English Horn.** Double-reed wind instrument of the hautboy family. *See* Cor Anglais.

# ENGLISH LANGUAGE AND LITERATURE

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*This article is divided into two sections. The language may be studied further under Alphabet; Phonetics; while for the literature there are articles on the great figures of English literature: Dickens; Fielding; Milton; Shakespeare, and others. See also the general article Literature, and those on various verse and prose forms, e.g. Ballad; Essay; Novel; Ode*

The earliest form of English—from the beginning to about one hundred years after the Norman Conquest—is sometimes called Anglo-Saxon, but nowadays more generally simply Old English. The people who lived in the oldest period called themselves *Angelcynn*, and their language *Englisc* in the vernacular, or, in Latin, generally *Angli*, sometimes *Angli sive Saxones*, and *Sermo Anglicus* or *Lingua Saxonica*. These terms are applied to all the tribes and to all the dialects.

Old English is shown by its vocabulary and its system of inflexions to be a W. Germanic language, closely akin to Old Frisian and Old Saxon, and still closely, though more remotely, to the High German dialects. The resemblances between Old English and Old Frisian are indeed so great and numerous that some regard these two groups of dialects as forming a special branch of W. Germanic speech subsequently differentiated into English and Frisian which they call the Anglo-Frisian branch. From the earliest records three main dialect types in Old English, corresponding to tribal divisions, may be distinguished: the Anglian dialects, i.e. Northumbrian and Mercian; the Saxon dialect; and the Kentish, spoken by the Jutes. The differences between these are comparatively slight, so far as they can be traced in the records, but the subsequent history of the several types is very different. The Angles settled in the N. and Midlands, the Saxons in the S. and S.W., and the Jutes in Kent, the Isle of Wight, and parts of Hampshire.

## The Old English Alphabet

The English, in common with other Germanic tribes, possessed an angular-shaped alphabet suitable for cutting or scratching upon metal, bone, and other hard substances. This is known as the Runic Alphabet, and the letters are called runes. A few inscriptions in this form survive on stones and whalebone, but probably none are much older than the oldest written documents of the ordinary kind. After the introduction of Christianity, the English learnt the art of writing from Irish monks, and the ordinary Old English alphabet is almost identical with that in which Old Irish was written. It was soon found convenient, however, to

borrow from the Runic alphabet two symbols to express characteristically English sounds—þ called "thorn" for *th*, and ƿ called "wen" for *w*. In modern editions of Old English works it is now unusual to reproduce the shapes of the MS. letters, which are printed in ordinary type except þ and ƿ which also stands for *th*; the vowel symbol æ, for the vowel sound in Modern *hat*; and occasionally ȝ the Old English form of *g*. The spelling of Old English, allowing for certain inconsistencies, is on the whole phonetic.

## Sound Changes and Dialect

Perhaps the most important aspect of the evolution of language is the change in pronunciation which continuously proceeds. Sound changes have a far-reaching effect upon the history of every language and bring much else in their train. Not only does sound change alter the whole external aspect and character of a language, so that by this means chiefly, or alone, dialect is often differentiated from dialect, and language from language, but sound change involves the alteration, or it may be the destruction, of inflexional suffixes, whereby the main features of accent are modified or swept away, and these losses of significant endings may, and often do, bring about a revolution in the syntax of the language.

It is now recognized that sound changes are regular in their effects, and that they take place, within a given period and in a given language, according to definite principles and conditions. Within the above-mentioned limitations of time and language and phonetic conditions the same sound will always change in the same way or direction. By the side of regular sound change, the principle of linguistic analogy, or the close association of form with form, whereby one is modified by the other, without normal phonetic development, is recognized as of hardly inferior importance to the action of phonetic laws. It must be remembered that language cannot exist apart from living human beings who speak it, and that change in language implies a change in the physical and mental habits of the speakers.

THE HISTORY OF ENGLISH. The history of English may be said to

have begun from the moment when the group of dialects known as Old English had become differentiated from the parent W. Germanic stock. At the moment of its earliest appearance in a written record, Old English had already undergone a number of characteristic changes which separate it from the nearest cognate languages. Under the conditions of complete geographical separation from the speakers of the other W. Germanic languages of the Continent, English underwent still further independent changes.

While alterations in the consonant changes were comparatively slight, those involving the vowels were considerable. There are two main classes of sound changes: *Isolative*, which arise in the sound of a language in the course of its history, without any discoverable reason, and without any influence exerted by the neighbouring sound in the word or sentence; and *Combinaive*, which result from the influence of one or more sounds in the word, or sentence, upon another sound, or from the effect of the position of the accent or stress in native words, upon the root syllable, not upon the prefix or suffix. In English, unstressed syllables have always been very liable to weakening, and are often eliminated altogether.

The Old English vocabulary is of a characteristic W. Germanic nature, and the great bulk of words are of this origin. There is, however, a considerable element of Latin loan-words: (a) those borrowed during the Continental period, e.g. *stræt* "street," Lat. *strāta* *via*, paved way; (b) those borrowed from Latin-speaking Britons in this country, such as *ceaster*, town, Lat. *castra*, camp; (c) those borrowed from Roman ecclesiastical sources, e.g. *pāpa*, pope.

## Effect of Spoken Latin

Latin must have been freely spoken among the upper classes of the Britons, and in the larger towns of Britain. Several Latin words which expressed ideas for which no equivalent existed in Old English were literally translated, such as *wehwilend* for *benevolens*. It has been suggested that, if the English invasion had not taken place, the chief language of the country would not be a form of Welsh, but more probably a neo-Latin, or Romance language. Celtic exerted

only a small influence upon the vocabulary in the Old English period, except in the names of hills, rivers, and other geographical features, which retained their old designations—*pen, avon, cumb, dūn*, etc. The Scandinavian influence, which began in the 8th century, shows very slight traces in the written documents before the 11th, by which time the English and the Danes in certain districts had amalgamated, and having passed through a bi-lingual stage, had settled down together, with English as the surviving language in a form which retained many elements of the language of the once hostile settlers.

With the rise of Wessex to the ruling political position among the Old English states, the literary labours of King Alfred made the dialect of this province the chief vehicle of literature. All the works of literary importance, both poetry and prose, which have survived, are written in a form of West Saxon, occasionally with traces of other dialects. This form of English may be regarded as a common literary standard for the whole country from the beginning of the 10th century.

#### From Old to Middle English

The Conquest had at first little effect upon the spoken language. Few Englishmen learnt French for several centuries, and they could not borrow words from a language which they did not know; nor was there any reason why the presence of foreigners ignorant of the native tongue of the country should in any way affect its pronunciation and inflexions. The changes made apparent by the spelling in the middle of the 12th century are not the result of the Norman Conquest, but the normal development of tendencies which were active before the Normans came. The rather abrupt contrast observable in the language of documents from about 1150 onwards does not represent any sudden new development, but implies that the old literary tradition, which largely concealed the facts of speech by means of an antiquated convention, has almost passed away, and that a new literary convention, and to some extent a new scribal mode of spelling, have begun which are nearer to the language of everyday life than was the older tradition.

The language of the last part of the Laud, or Peterborough Chronicle, written soon after 1157, is still in a sense Old English, but many changes are observable. The highly inflected Old English definite article has to a great extent given way to an uninflected form, *þe*,

"the," which never varies, but takes prepositions before it to express case-relations which Old English expressed by inflexion. Such constructions as *þe wreece men of þe land* "the wretched men of the country," *betwux þe kinges freond and þe earles freond* "between the king's friends and the earl's friends," sound strangely modern. Already in the latter part of this Chronicle the unstressed vowels are fairly regularly written *e*, as in the later Middle English period, to represent Old English *o, a, u* and *e*. The Norman scribes have taught the Englishman the useful graphic distinction between *f* and *v*, whereas the latter formerly wrote *f* for both sounds. The Old English accusative singular of the third personal pronoun masculine, *hine*, has already been lost in favour of the dative *him*, as at present, the feminine pronoun *scæ*, the ancestor of *she*, first appears instead of the old *hēo*.

The present-day use of a preposition at the end of a sentence occurs—*me lihtede candles to eten by* "men lighted candles to eat by." The case-endings of adjectives are largely lost. Although most of the typical Middle English changes in the vowels are not yet consistently expressed in the spelling, there appears an uncertainty and a tentative groping after the best way of expressing a pronunciation which is evidently changing. As regards vocabulary, a few French words are used, all more or less technical, expressing new and foreign conceptions or institutions, offices or titles—*canceler, prisun, cuntesse, emperice*. The only word which might be considered non-technical and belonging to everyday life is *pais*, "peace." A few new Scandinavian words are used: *tōc* "took," and *oc* "and." The usual English words *niman* "take" and *and* are also used.

#### The Middle English Period

This may be held to begin about 1200. The process of change is more rapid in the dialects of the N. and those of the E. Midland than in those of the S. and of the S.W. Midland. In the N. especially the loss and confusion of flexional endings has gone very far by the beginning of the 14th century. A characteristic of the Middle English period is the great dialectal variety which finds expression in the written documents. The main types are the N., which includes the dialect of S. Scotland; the E. Midland; the W. Midland; the S.W. Midland, including the dialects of Herefordshire, Worcestershire, Oxfordshire, and Shropshire; the S. dialect, including all types as far

E. as Surrey; the S.E., including the speech of Kent and Essex. The London dialect, which in its earliest forms shows a mixture of purely S. with Kentish or S. Eastern forms, becomes increasingly important from the first quarter of the 14th century onwards.

#### The London Dialect

Early in the 14th century the London dialect is still largely pure S. in type, that of Surrey and Middlesex, but shows certain Kentish or S.E. features, and a slight tinge of E. Midland. By the end of the century, Chaucer and those of his contemporaries who write in this dialect show an increasing number of purely E. Midland features, rather strong S.E. influence, and a certain survival of S. characters. Chaucer is fairly representative of the best London and court English of his day. Owing to the political and commercial importance of the capital, the type of English there spoken was naturally bound to become the leading variety in the country, and the prestige of Chaucer and the popularity of his writings led to many imitations, not only of his style but of his dialect, even among writers who did not speak London English.

Nevertheless, for the most part, throughout the 14th century, people continued to write in the dialect which they spoke. The beginnings of a change may be seen when Chaucer's contemporary, Gower, writes, not in the Kentish dialect which was naturally his own, but in a close approximation to that of London, with but few provincialisms to betray his native dialect. The Middle English period may be said to close with the death of Chaucer, or in the first quarter of the 15th century, and soon after that date there are no more literary works written in pure provincial dialect, except in Scotland, which had a standard of its own, so that the history of English centres more and more round that one form which has become the universal standard. But while the London type predominates increasingly in written documents of all kinds, from whatever area, there are plenty of traces, far into the 15th century, of the provincialisms of the writer's native speech.

The vocabulary of Chaucer is very largely our own. He uses Norman French words, not here and there, like early Middle English writers, but as indispensable elements of his style. Norman French words are no longer foreign, but hundreds have penetrated into the very fibre of English speech, and it is not very easy to write many consecutive sentences not containing words of

this origin. Norman French having been the language of the upper classes for nearly 300 years, and the official vehicle of law and government, was abolished in courts of law in favour of English in 1362; in 1385 it was no longer used in schools; by the end of the century it was probably dead as a spoken language. The Scandinavian element is very large in Middle English in the N. and E. Midland dialects.

#### Modern English

The chief event in the general history of English since the beginning of the 15th century has been the gradual acceptance of a virtually uniform dialect by all writers. This agreement was greatly helped by the introduction of printing in 1477. Caxton, himself a Kentishman, adopted the London dialect for his translations and prefaces, and a knowledge of this type was rapidly diffused throughout the country through his labours. Even in the mid-15th cent. provincial or regional dialect was falling into disuse in writing.

The adoption of a standard of spoken English was a much slower process. George Puttenham, in his *Art of English Poesie* (1589), says that in the N. noblemen and gentlemen spoke their own dialect; Aubrey has it from one who knew Sir Walter Raleigh that he spoke broad Devonshire all his life. In the 17th century comedies country gentlemen who come to London for the first time are made to speak a broad rustic form of English, and as late as the 18th century Fielding makes Squire Western speak pure Somersetshire. It was the language of the court which in Elizabeth's day was recognized as the best form of spoken English, and upon this the literary English of the day, the ancestor of our own, was based. The English of Caxton is virtually the descendant of that of Chaucer. The differences between the two are due chiefly to the growing encroachment of the E. Midland element in London English since Chaucer's time.

Since the Middle English period English pronunciation has changed considerably, although the conventional spelling handed on, with few modifications of importance, from the early printers who derived it from the professional Middle English scribes, reveals next to nothing of this. All the long vowels and all the Middle English diphthongs have altered completely in character. Many changes in the pronunciation of consonants have also taken place, though some of these have since been

"restored" through the influence of the received spelling. The same factor has influenced to some extent the pronunciation of unstressed vowels which in the Early Modern period had undergone considerable weakening.

It is a necessary result of the recognition of a standard dialect, which in origin was that of the upper classes, that other forms fall into disrepute, and are considered either vulgar or merely provincial and rustic. The latter epithets are now applied to the modern regional dialects, while the former justly applies to certain forms of English, cognate with the best form of spoken English in origin, but differentiated from it in the mouths of the humbler and less refined classes of society. The principal sound changes were probably complete, or at least well under way, by the end of the 16th century, though the final distribution of the various dialect types which compose standard English was not yet finally settled. The subsequent history of standard spoken English is very largely the result of the influence exerted upon this by other class dialects, and to some small extent by regional or provincial dialects.

#### Modern English Sound Changes

The changes made in the English vowel system from the "Continental values" to approximately our present pronunciation are traceable from occasional spellings of the scribes, in some cases as early as the early 14th century, very clearly and frequently in the 15th century, when private letter writing began to be practised by all sorts of persons, and in the 16th and later periods, not only from this source, but also from deliberate descriptions of English pronunciation. Most of the typical modern vowel changes began very early, but acceptance of many of these in court English was considerably later than the 15th century, and some appear to have been accepted only in a few words. Many of them were considered vulgarisms at first, and penetrated into the standard language through the influence of lower class London English. Many pronunciations used by the best speakers during the 17th and 18th centuries would now appear vulgar, rustic, or, at least, antiquated. Among these may be mentioned *sarvis*, *sarvant*, *sarmon*, *vartue*, *Booshop*, *gould*.

There is ample evidence from the 15th century onwards that the present day natural pronunciation of the vowels in unstressed syllables either with the "murmur vowel" (e) as in second syllable of *father*,

or with *i* was already in vogue. In the 18th century words with *on* were often pronounced as with *in*, e.g. *flaggin*, *dunjin*, *sturjin* for *flaggon*, *dungeon*, *sturgeon*, etc. The ending *ure* was pronounced like *-er* far into the 18th century—*joiner*, *picter*, *nater*, etc. Such a word as *fellow* was pronounced *feller* (without *r*), and Pope rhymes it with *prunella*. The present-day pronunciation of the suffix *-es*, *-est*, *-eth*, etc., as *-iz*, *-ist*, is already established as the polite one in the court English of the 15th and 16th centuries by such spellings as *horstis*, *princis*, *eldist*, *girth*, etc.

#### Spelling Pronunciation

In the 18th century *nus*, *pus*, *Ushy*, *thusty* are the spellings of a writer on pronunciation to express the proper forms of *nurse*, *purse*, *Ursula*, *thirsty*. The ending *-ing* was pronounced as *-in* as early as the 15th century, and this was probably universal in standard English until the end of the first quarter of the 19th century, when the spelling pronunciation won the day to some extent. Usage now varies. The loss of the sound of *gh* in the middle of words before *t* is shown to have been caused in the 15th century by the omission of the symbol in words where it belongs historically, and by such spellings as *dought* "doubt," *ought* "out," *wright* "write." In the 16th century even Spenser often writes *whight*, *quight*, etc. The sound of *w* develops initially before *o* and *ho*; *won* for *one* is fairly common in the 15th century, and in the 16th occurs in the letters both of Henry VIII and Elizabeth. The spelling *whole* has been retained. Consonants are often lost, finally and in combinations, as is proved by spellings from the 15th century onwards.

Similar pronunciations are recorded in the 18th century. The following 15th and 16th century spellings show losses in combinations in the middle of words: *Whysson weke* "Whitsun"; *Wensday*, *morgage*, *sepukyr*, *Wostreet* "Wood Street." Queen Elizabeth herself writes "often" *offen*. *Lunnon* was a polite 18th century pronunciation. Many of these forms survive at the present time, but the consonants are now often restored from the spelling. At the beginning of unstressed syllables *w* was normally dropped already in Middle English. It has been largely restored, however, through the influence of the spelling. While *w* is still omitted in *Norwich*, *Southwark*, etc., it has been restored in *forward*, earlier *ferrard*, *Edward*, etc. *Eddurd* was the polite 18th century pronunciation, and



survived among old-fashioned speakers far into the 19th.

Weak plurals are more frequent among good writers in Early Modern English than now, e.g. *housen, shoon, eyen, All Soulen, peasen*. The old feminine possessive without *-s* is found commonly as late as the 16th century—*Our Lady Mary Grace, the Queen Grace*, etc. These survive now in *Lady Chapel, Lady Day*. The personal pronouns *her* (possessive) and *hem* (dative plural) are frequently used in the 15th century by the side of *their, them*. The former is apparently not found after the early 16th century; the latter is rare in the 16th and early 17th, but reappears in the 18th century as *'em*. "Group inflexion" in the possessive of nouns is found as early as the 15th century—the *erle of Wiltones wyf*—by the side of the older construction, the *dukys daughter of Northfolke*. Such constructions as for *Jesus Christ His sake* are very common in the 15th and 16th centuries, the pronoun being often detached and written *is*, and sometimes joined to the preceding noun as a possessive suffix, which it originally was.

The old Southern present plurals of verbs in *-eth* linger on in occasional literary and colloquial use far into the 16th century, though the form without ending is far commoner. In the 15th century the forms in *-en, -in* are still often used. The third person present singular ends in *-eth, -ith, or -th* during the whole of the 15th and 16th centuries in the best English. The forms in *-s* come in gradually, at first chiefly used either in poetry for the sake of rhyme or metre, or in fairly colloquial style. They are by no means universal by the end of the 16th century. *Haith* and *doth* survive far into the 18th century in both colloquial and literary use. Pope uses *was after you*, when one person only is addressed. This practice survived in good colloquial use into the 19th century.

#### Shifting Standards of Correctness

A careful study of the history of English from the earliest times, based on intelligent interpretation of the written records of the successive ages, leaves an impression of continuity amid perpetual change. The history of standard English during the last 500 years has been largely one of the varying distribution of elements drawn first from regional and later from social dialects. The standards of what is polite and correct shift from age to age. What is vulgar in one generation becomes the

pattern of propriety in the next; that which was elegant and habitual to the most refined speakers is felt to be slipshod or worse. Since the early 19th century there has been a great striving after "correctness" in English speech. Our speech today is far less untrammelled in its colloquial forms than that of the 17th and 18th centuries. Good speakers then seem to have been content to follow the natural tendencies of unstudied utterance, and were less anxious for "correctness" as this was later understood. This process is still going on and, with the increased diffusion of education among those who have no traditional knowledge of the best speech, bids fair to alter our language out of all recognition.

#### Assimilation of Idiom and Jargon

From three main sources, obvious especially in colloquial speech but also in writing, come the contributions of the 20th century to the growth of English vocabulary. The influence of the cinema has added a deposit of American words and idioms, several of them new inventions, but many, e.g. *crack* for witticism, recrossing the Atlantic to the land in which they were current centuries ago. There is a tendency to apply semi-technical terms from the sciences, like *complex* and *allergic*, or from warfare like the nouns *drive* and *front*, in metaphorical and often inappropriate contexts. Old boundaries between parts of speech are broken down by turning nouns into verbs (*telephone, contact*) or into adjectives (*railway journey, control board*). If it be claimed that these tendencies enrich the language and make it more responsive to the subtleties of expression needed in a world of specialists, there is also the result that layers of jargon are spread over the pattern of what used to be regarded as lucid English. But a language already so indebted to foreign tongues can know no logical ban upon further borrowing. The best hope is that the more tawdry pieces of the new coinage will not be allowed to continue in circulation.

It is impossible to foretell the future of English, though we may well believe that it will be no meaner or less splendid than its past. New standards of speech will in all probability arise with the growth of new centres of culture in this country, and still more in the dominions, whose populations are still "mewing their mighty youth," and future historians of spoken English will have to take into account the many

varieties of our mother tongue, spoken by peoples of different experiences and modes of life.

H. C. K. WYLD

LITERATURE. Anglo-Saxon literature is interesting rather as a document illustrating the spirit of the English stock, Angles and Jutes, than as a direct ancestor of English literature as traced from Chaucer. For modern English literature does not derive directly from Old English literature. From the 11th century, even before the Conquest, to the 14th century, England was a pupil in the school of France. For the greater part of this time Latin was the language of learned, French of polite, literature. For three centuries English and French jostled together, with the result that when at last in the 14th century English came into its own, it had become the rich composite speech, in vocabulary and syntax, which was to be the medium of English poets from Chaucer to the present time; and in the same centuries, English poets gradually assimilated, adapting it to the genius of the English language, the syllabic, accental metre which had been first heard in the Latin hymns of the Church and Provençal and French song.

#### English Versions of French Themes

French literature itself was only beginning when the Normans conquered England, but in the 12th and 13th centuries the French poets of Provence and Gascony, of France proper, and of England, created the romantic and lyric literature which is the fountain-head of all modern European literature. The new love-poetry of Provence, with its courtly and ideal, but also conventional, cult of love, the romances of Charlemagne, of Arthur and his knights, of Troy, Thebes, and Alexander, beast-epic and allegory and fabliau—these were made by the French familiar to every country of W. Europe and reproduced in other tongues. In the creation of this courtly literature as such England took no part; but when English literature began to awaken again it was in the reproduction of French themes and forms.

The first English poem written after the Conquest, which is really a work of literature, Layamon's *Brut*, is a long and interesting elaboration of that legendary history of Britain, from Brutus to Arthur, which had first taken the shape of history in the *Historia Regum Britanniae* of Geoffrey of Monmouth, and had been already cast into verse by the Norman

poet Wace. But Layamon makes interesting additions from Welsh oral tradition. The verse is apparently intended to follow the Old English model, but is rapidly approximating to an English reproduction of the French octosyllabic or four foot verse, the long line falling into two parts. Even in religious and didactic works of no great literary merit, the *Ormulum*, the *Bestiary*, etc., we can note the interaction of old English form and feeling with the new influences; but the full effect of French inspiration in the begetting of a new literature, fresh in spirit and in form, is seen in the lyrics and the romances of the 13th and early 14th centuries.

#### Early Lyrics and Romances

The earliest English lyrics, songs like *Sumer is i-cumen in*, *Lenten is come* with love to town, are the work of poets familiar with the French lyric, its rhythms and its tone, gayer than that of Old English poetry. They blend in humorous fashion lines English, French, and Latin. The same is true of the first English romances, all probably translations, even when, as in *King Horn*, *Havelok the Dane*, *Richard Coeur de Lion*, *Bevis of Hampton*, and *Guy of Warwick*, they deal with native legendary themes. And all the varieties of French romance, Carolingian, e.g. *The Sowdone of Babylon*; Arthurian, e.g. *Lybaeus Desconus*; Oriental, e.g. *King Alisaunder*; classical, e.g. *The Destruction of Troy*; and miscellaneous romances of adventure, e.g. *Ipomydon*, are represented.

All lack the courtly tone of French romance, being composed for popular audiences who love a genially told story of adventure rather than refinement of sentiment. In their diction we see the shaking together of the elements, English, French, and Scandinavian, which make up the rich tongue of Shakespeare and Milton; while in the metrical, not alliterative, poems, we can trace the process by which the syllabic rhythm of French verse was adjusted to the idiosyncrasies of stress and cadence in English pronunciation. Outside romance and lyric, poetry of the 13th and early 14th centuries is didactic—the *Cursor Mundi*, a long paraphrase of Scripture history and Church legend; the *Pricke of Conscience*, a summary of theology, erroneously attributed to Richard Rolle of Hampole, a writer of mystical works in Latin and English prose; Robert of Gloucester's verse histories, and other works.

The 14th century witnessed the victory of English over French, even at court. In the same century appears an English poetry artistically on a level with the best of France and Italy. The movement to raise the artistic level of poetry took two directions. One was an artificial and abortive attempt to revive and elaborate, with or without the addition of rhyme, the old alliterative verse—a movement which produced the finest of the English romances, *Gawain and the Green Knight*; the beautiful elegiac and symbolic poem, *The Pearl*; and the interesting, if inchoate, satirical, didactic, and mystical poem known as *The Vision of Piers Plowman*, attributed to William Langland, of whom the poem supplies a shadowy outline.

But the future of English poetry lay with those who completed the naturalisation of French poetry, its regular metre, its refined and courtly spirit, its grace and elegance of style. John Gower, after experimenting in a satirical Latin poem, and a tedious didactic poem in French, composed at the close of his life a long poem in English, *Confessio Amantis*, in which he sets in the framework of the confession of a lover to Genius, the priest of Love, a series of stories drawn from many medieval and classical sources and narrated in smooth, equable, well-turned octosyllabic couplets.

#### Spirit of Chaucer's Poetry

Geoffrey Chaucer, however, did more than this. Brought up at court, and sent in later years on missions to various lands, including Italy, Chaucer was educated in the tradition of contemporary French poetry. His earliest poem, *The Book of the Duchess*, is an elegant but jejune dream allegory, a love poem whose incidents are represented as happening in a dream, the characters being personified abstractions. But the majority of Chaucer's extant poems were written after he had made acquaintance with the Italian poetry of Dante, Petrarch, and Boccaccio.

The *House of Fame*, an incomplete, ironical allegory, shows the influence of Dante in style and incident. The *Parliament of Fowls* enriched its decorative fabric with borrowings from Boccaccio. Chaucer's first and greatest dramatic story, *Troilus and Criseyde*, is based on the same poet's *Filostrato* with an incident from the *Teseide*. The *Teseide* itself is the source of the chivalrous story of *Palamon and Arcite* which became the *Knight's Tale* in *The Canterbury Tales*. The

stories collected in the *Legend of Good Women* are drawn from Ovid and from a couple of Latin works by Boccaccio. The charming Prologue to the poem is Chaucer's own.

But much as Chaucer learned from Italy, the more serious and idealistic spirit of Dante and Petrarch did not pass into his poetry. That transmission was reserved for the 16th century. To the end the spirit of Chaucer's poetry is that of the French love-poetry, allegoric and romantic, qualified by his own bent towards a more realistic and humorous handling of conventional themes. The latter bent achieved its complete emancipation in the Prologue to *The Canterbury Tales*, with its vivid and ironical pictures of all the social types of the England of the 14th century.

#### Chaucer's Successors

The best of the tales are in the vein of the Prologue, fabliaux, satiric tales, told with consummate dramatic and poetic art. Only in the fragment of *The Squire's Tale* does the poet reopen the well of pure and enchanting romance. Chaucer gave England a courtly poetry superior in dramatic and poetic interest to the poetry of France. He embellished it with beauties derived from the great Italian poets. He breathed into the whole a spirit entirely English, and in his hands the English language attained to all but the highest perfection of poetical diction and metrical beauty.

Chaucer had no adequate successors for nearly two centuries. John Lydgate and Thomas Occleve kept faintly burning the tradition of didactic allegory and story, and handed on the lamp to its last representative, Stephen Hawes, author, in Henry VII's reign, of *The Pastime of Pleasure*. In Scotland this courtly poetry enjoyed a brighter S. Martin's summer.

The popular literature of the 15th century is of greater interest than the courtly. The religious drama, the mysteries and miracle plays, reached their highest level in the 14th century, and gave place in the 15th to the moralities. To the 15th century probably belong also the oldest of the ballads which, taking the place of the longer lays, preserved the quintessence of the old romances in a way that was to quicken the romantic spirit with surprising and delightful results in later English poetry. Of artistic prose in Middle English, the tentative beginnings may be best studied in Chaucer's translation of Boethius. The 15th century witnessed a fairly steady advance of

prose as an artistic medium whose finest result is the *Morte d'Arthur* of Sir Thomas Malory.

The revival of learning in the 15th century made Italy the centre of influence in literary fashions as definitely as France had been so in the 12th and 13th centuries. That influence came to England in two successive waves—from Italy direct in the reign of Henry VIII. from Italy by way of France in the reign of Elizabeth. Stephen Hawes was still writing dull allegory, and John Skelton was burlesquing the same in individual fashion; the older tradition of amorous and gay songs and carols after the French manner was still in vogue with Henry VIII and his musicians; when Sir Thomas Wyatt and Henry, earl of Surrey, having "tasted the sweet and stately measures and style of Italian poesie," began to cultivate this more dignified and passionate note in sonnets, in irregular imitations of the canzone and other Italian forms, and in songs, all published after their death in Tottel's *Miscellany* (1557).

#### French and Italian Influences

The twenty years which followed was a period of arrested development and of experiment, especially in verse translation from Latin, e.g. Arthur Golding's *Ovid*. The one bright ornament is Thomas Sackville's *Induction* and *Legend of the Duke of Buckingham*, contributed in 1563 to *The Mirror for Magistrates*, which, apart from these poems, was but a dull continuation of Lydgate's moralising "tragedies," and sententiously narrated stories of the overthrow of great men through the fickleness of fortune.

When the *Shepherds' Calender* of Edmund Spenser appeared in 1579, the artistic influence of Italy and France was reacted upon by the temperament of a people whose national self-consciousness had grown eager and intense, and whose spiritual life was being profoundly modified by that religious Reformation which tended to separate them from the Latin peoples who were their artistic tutors. The result was naturally complex, a literature at once national and exotic, at times Italian in its dissolute moral tone, again already growing Puritan in its moral ardour, rich in felicities and beauties of style and verse, yet abounding in fantastic extravagances.

Spenser's pastoral, *The Shepherds' Calender*, his allegorical romance, *The Faerie Queen* (1590-96), and all his shorter poems, satirical, elegiac, and lyrical,

reveal the influence of French and Italian poetry, of Italian Platonism, of Chaucer and of Sir Thomas Malory; but the spirit which strives to harmonise the whole is that of an Elizabethan Englishman passionately patriotic and Protestant. And if much remains unharmonised, the discords are held in solution by a style diffuse in picture and melody, a verse in which the grave iambic movement of Sackville's *Induction* is heightened by every resource of varied cadence which English metre permits, and adorned with all the accessories of alliteration and vowel-music which English verse welcomes.

Of all the exotic forms naturalised by Wyatt and Surrey, the sonnet enjoyed the greatest popularity in the closing decades of the century. One sequence of love sonnets, after the fashion of Petrarch's *Laura*, followed on another in rapid succession, including Sir Philip Sidney's *Astrophel and Stella*, Samuel Daniel's *Delia*, Michael Drayton's *Idea*, Spenser's *Amoretti*, and the later published *Sonnets of Shakespeare*. The Elizabethan sonnets are largely translations and imitations, and abound in the conventional and extravagant conceits which are common to the kind, while few or none have the exquisite perfection of form which makes Petrarch a classic. But on the best of the English sonnets, as on Michael Angelo's, is set the impression of personality, the insolent gallantry and passion of Sidney, the brooding thought, the self-abnegation in friendship, of Shakespeare.

#### Elizabethan Poetry

The same poets experimented in many kinds, e.g. in the decorative Ovidian idyll, as Marlowe's *Hero and Leander*, Shakespeare's *Venus and Adonis* and *Rape of Lucrece*; and the same overwrought rhetoric characterises Daniel's *Rosamund*, a continuation of the *Mirror for Magistrates* type of story, and Drayton's antithetic imitations of Ovid's *Heroides*, imaginary love-letters in verse, England's *Heroical Epistles*. But Daniel and Drayton cultivated a severer style in their historical poems, suggested by Lucan's *Pharsalia*, Daniel's *Civil Wars* between York and Lancaster, and Drayton's *Barons' Wars*.

Daniel, George Chapman, Drayton, Sir John Davies, author of *Orchestra* and *Nosce Teipsum*, John Donne, Sir Henry Wotton, and others cultivated a grave philosophical poetry, frequently epistolary in form, in which Stoicism and Christianity are blended. Distinctively religious

poetry, whether Roman Catholic, like Robert Southwell's *St. Peter's Complaint* and Henry Constable's *Spiritual Sonnets*, or Protestant, like Joshua Sylvester's translation of Du Bartas' *Divine Weeks and Works*, shows the same elaboration of style and sentiment. The crown of Elizabethan verse translations are George Chapman's *Iliad* and *Odyssey*.

The greatest and happiest work was achieved in drama and song. In the closing decades of the century a new impetus was given to song writing by the study of lute music and the coloured, cadenced lyric of the French renaissance poets, Ronsard and his fellows, with the result that a lyric of many moods, and a new wealth of imagery and harmony, adorned romance and drama, or was garnered in song-books and anthologies such as England's *Helicon* and Davison's *Poetical Rhapsody*. Songs were composed by all the poets of the day, and many of the most charming are anonymous.

#### Growth of the Drama

The drama is a larger subject, and its history in the 16th century is one of shifting and confusing development, of overlapping kinds, of natural evolution crossed and disturbed and directed by extraneous influence. The *Morality*, which had produced in the later 15th century such a fine flower of serious drama as *Everyman*, was responsible in the 16th for the impressive *Cradle of Security*. Farce of a realistic kind—thumb-nail sketches of low life in London—mingles with the serious element, especially in *Moralities* dealing with the follies of youth.

The general tendency of the *Morality* is to be dull, and this was intensified by the Renaissance schoolmaster's love for the didactic, as in John Rastell's *Interlude of the Four Elements*, by such political allegory as *Lord Governance*, and by the Reformation passion for polemic, as in John Bale's *The Three Laws*, etc., *Lusty Juventus*, *Respublica*, and others. Queen Elizabeth checked this intrusion into controversy. The same Bale's *Kyng Johan* and a play like Thomas Preston's *King Cambyses*, or the weird version of Aeschylus's great story, *Horestes*, show how *Morality* blended with story and developed into the characteristically Elizabethan product, the story play, serious or farcical, or more commonly a blend of both.

Classical influence made itself felt, here as in other countries, in attempts to reproduce the exact

form and features of Seneca's Latin tragedies, *e.g.* in Sackville's *Gorboduc*, and of Latin comedy, *e.g.* Nicholas Udall's *Ralph Roister Doister*. The attempt miscarried, and the dominant type of play of the '60's and '70's was the story-play, the play which brought on the stage all the crowded incidents, dramatic and undramatic, of a story drawn from any and every source, with little interest of character and no beauty of style. The artistic, refining effect of classical and Italian influence made itself felt when into these story-plays was breathed something of the spirit of ancient comedy and tragedy, and they were clothed in a new beauty of form, prose and verse.

#### Marlowe and Shakespeare

John Lyly led the way in the reform of the drama as literature with his light and graceful, if flimsy, mythological and courtly comedies. George Peele sweetened the versification and brightened the fancy of comedy and romance, and Robert Greene is mainly responsible for the woodland settings and the fair maidens of Shakespeare's *As You Like It* and *Twelfth Night*. Thomas Kyd achieved a success by his *Spanish Tragedy*, which popularised the melodramatic revenge-motive and the stilted rhetoric of Seneca, while eliminating the choruses and loosening the structure. But the great forerunner of Shakespeare was Christopher Marlowe (*Tamburlaine*, *Dr. Faustus*, *Edward II.*), who gave to serious English drama stateliness and splendour of form, while quickening within it the soul of dramatic interest. His blank verse is the overture to the fuller, more varied harmonies of Shakespeare and Milton.

In William Shakespeare a great tradition found its fullest expression. The statue had been blocked out, the tools were ready to his hand. It was no restraint to him, it seems rather to have been a help, to revise older work, to collaborate with lesser men. But the miracle of genius remains. The tradition broke into a new life in his hands. The old play, the lesser dramatist, found through him their fulfilment. He neither led nor followed, he moved instinctively with the changing currents of taste. His early tragic histories, *Henry VI* and *Richard III.*, are Marlowesque in spirit and style; his early comedies and romances, *Love's Labour's Lost*, and *A Midsummer Night's Dream*, absorbed and enriched all the currents that flowed more faintly in Lyly and

Peele and Greene. As the century draws to an end he satirises the bombast of Marlowe and Kyd through *Ancient Pistol*, and Lyly's Euphuism in the wit of *Falstaff*, and blends heroic history, full of the same spirit as Daniel's and Drayton's *Chronicle poems*, with genial and boisterous comedy.

And when Jonson turned drama from romance to realism, Shakespeare passed to tragedy, tragedies of character and adverse stars in *Hamlet* and *Julius Caesar*, tragedies of great souls driven from their orbit by passion to clash and destroy and perish in *Othello* and *Lear*, and the style and imagery and verse change with the change of theme. Lastly, when Beaumont and Fletcher revive the futings and falsetto of romance, Shakespeare, too, turns back to the charm of romantic setting and pathetic lovers and children and flowers and poetry and reconciliation. He works with all his fellows, but gives to each kind of play an infinitely richer dramatic and poetic worth.

English prose in the 16th century felt the influence of Latin in vocabulary and structure. The prose of the 16th century—of John Fisher, Thomas Elyot, Roger Ascham, Thomas North, and others—is a happy blend of simple, direct, colloquial English, with a free importation of Latin words and a sentence shaping towards the Latin period. The finest product of this are the translations of the Bible, from Tyndale to the Authorised Version, a book which has shaped and coloured, as perhaps no other, the diction and rhythm of the best English prose and verse.

#### Hooker and English Prose

For the last two decades of the century prose, like verse, came under the influence of the taste for elaborate rhetoric. Lyly's *Euphuës* set the fashion of antithesis, alliteration, and artificial simile for a succession of imitators in novels and pamphlets, Robert Greene, Thomas Lodge, Thomas Nash, and Thomas Dekker; though in Nash and Dekker a racy colloquialism blended with and superseded the tricks of Euphuism. Sidney cultivated a more poetical rhetoric in his *Arcadia*, and, with much less of artifice, in the *Defence of Poesie*. Richard Hooker, in the *Ecclesiastical Polity*, raised the Latinised, periodic prose to a higher level of rhythm, and dignified eloquence, and made English a fitting medium for philosophical disquisition.

The literature of the earlier 17th century is as varied in character as that of the 16th. The first fifteen

years witnessed the culminating achievement of the drama in Shakespeare's great tragedies and the sombre, extravagant, but impressive work of Marston, Chapman, Middleton, and Webster, and in the sardonic, unromantic "humours" comedy of Ben Jonson and his classical tragedies. In the work of Beaumont and Fletcher, Massinger and Ford, Shirley, and smaller men, we study the setting of a brilliant day in a sky rich in the colours of sentiment and phrasing.

#### John Donne and Ben Jonson

In poetry Spenser found no follower in the endeavour to revive, and give a new significance to, the chivalry of medieval romance, though Ariosto and Tasso were translated by Sir John Harrington and Edward Fairfax. But Spenser's pastoralism was variously tuned by many poets, as William Browne, *Britannia's Pastorals*; and Drayton, *The Muses Elizium*; and the Scottish Drummond of Hawthornden, a late Elizabethan, in his Italianism and his love for sonnets and pastorals. The didactic, allegorical, religious aspect of Spenser's work appealed more strongly than the romantic and chivalrous to ardent Protestants like the poet brothers Giles Fletcher (*Christ's Victory and Triumph*) and Phineas (*The Purple Island*).

None, however, of these overflows from Elizabethan poetry, modified by the changing spirit of the time, represents quite clearly the two main directions in which literature moved during the century, on the one hand towards an increasing weight and fullness of thought and conceit, to which is sacrificed grace and beauty of form and verse, on the other towards more definiteness, uniformity, and correctness of style and verse. The dominant influences in this two-fold movement are the late Elizabethan poets, John Donne and Ben Jonson. The poems, erotic, satirical, complimentary, and religious, of the former fascinated all the younger, bolder spirits by their intellectual subtleties and passionate perversities of feeling, their rugged strength and frequent felicities of phrase, their contemptuous violations of smoothness and sweetness in versification with the deep and plangent harmonies which none the less they repeatedly achieve.

Ben Jonson, in his songs and epigrams and odes and verses, complimentary and satirical, combines the same compacted pregnancy of thought with a constant, though not always successful, striving after

classical definiteness of form, classical finish, and felicity of phrasing. The influence of both is obvious in English poetry to the time of Cowley and Dryden. Jonson's and Donne's best disciples are the courtly lyrists, Thomas Carew, Richard Lovelace, John Suckling, Thomas Stanley, and a host of others down to the earl of Dorset, the earl of Rochester, Charles Sedley, Aphra Behn, and John Dryden himself in the years after the Restoration. The greatest of them, as artist and poet, is Robert Herrick, the greatest Epicurean and fanciful songwriter in our literature. The influence of Donne, his metaphysical wit and his passionate egotism, is most directly traceable in the religious poets, Anglican and Catholic—George Herbert, *The Temple*; Henry Vaughan, *Silex Scintillans*; Richard Crashaw, *Steps to the Temple*, and *Carmen Deo Nostro*; in Thomas Traherne, and others. But, together with Donne's influence, that of Italian religious poetry, with its sugared conceits and the mysticism of Spanish writers, as S. Theresa and John of the Cross, can be recognized.

#### The Poetry of Milton

The greatest of seventeenth century poets, John Milton, shares the taste of his age for compacted thought and multifarious learning while despising its fantastic and metaphysical conceits. In his poetry, Ben Jonson's ideal of classical form and finish is ministered to by a finer ear and by a poetic temperament and imagination as spontaneously creative as those of the greatest Elizabethans. The early Cambridge and Horton poems, the *Nativity Ode*, *At a Solemn Music*, *On Time*, *L'Allegro* and *Il Penseroso*, *Arcades*, *On the Marchioness of Winchester*, *Comus*, *Lycidas*, combine the spontaneity, fancy, and ravishing music of Spenser and Shakespeare with a consciously elaborated art, architectonical, stylistic, and metrical, which, on this scale, was a new thing, and has never been surpassed in the history of English poetry.

*Paradise Lost* is built from the stern experiences and the rigid political theology of the years of rebellion and pamphleteering. The freshness and charm of the earlier poems are gone, but their loss is compensated for by grandeur of epic creation in incident, character, and setting, and by the most majestic and harmoniously modulated blank verse which English ears have ever heard. *Paradise Regained* is a paler reflex of these qualities, but into *Samson Agonistes*, Milton's experiment in classical tragedy, he poured the passion of his own

sufferings and the defeat of his cause, the pride of his defiant will, clothing them in words and measures as sublime as they are severe.

But the movement towards classification, definiteness, and perfection which fulfilled itself so strikingly in Milton followed a line of less resistance in the work of Edmund Waller, John Beaumont, John Denham, William Davenant, and Abraham Cowley. In Cowley's *Mistress* and *Pindarique Odes* and *Davideis* the extravagances of the earlier period are made the more obvious by the subsidence of the imaginative passion which in Donne inspired and condoned for these; but the common aim of the others, conscious or unconscious, was the rejection of this extravagance, the limitation of the pattern which verse might follow, and the exaction of a higher degree of correctness within that pattern.

The movement was carried to a triumphant success by John Dryden, a far inferior poet to Milton, but the first and among the most accomplished of English men of letters—dramatist; poet, eulogistic, lyrical, satiric, and didactic; translator; literary critic; and essayist. In Dryden's verse and prose the English language is written as we still use it; he is our first modern. His satires, as *Absalom* and *Achitophel*, and didactics, as *Religio Laici*, *The Hind* and the *Panther*, are an idealised reflection in verse of easy, masculine conversation or eloquence. His odes are our supreme examples of lyrics in which there is not a note of song but all is artfully managed noise and declamation. Working within a still more limited pattern, Alexander Pope achieved, in the next generation, a yet higher degree of pointed and polished perfection.

#### Dryden and Pope

Nothing can surpass in its own way the eloquence of *Eloisa* to *Abelard*, the satirical miniature-painting of *The Rape of the Lock*, the aphorisms and declamations of the *Essays on Criticism* and *Essay on Man*, the condensed, polished, poisonous satire of the *Dunciad*, *Moral Essays*, and *Imitations of Horace*. Dryden and Pope are the high priests of a school of poets including *Prior* and *Gay* among their contemporaries and a succession of elegant, conventional poets, continued to the end of the century and beyond, whose work may be studied in a collection like *Dodsley's*.

The Restoration drama of England is represented by the high-flown and absurd, but eloquent, heroic plays of Dryden, the path-

etic, rhetorical tragedies of Nathaniel Lee and Thomas Otway, the brilliant, polite, licentious comedy of George Etherege, George Farquhar, William Wycherley, John Vanbrugh, and especially William Congreve. Thereafter, except for brief intervals, as in the plays of Goldsmith and Sheridan and the drama of our own day, the acted drama has not formed an important section of English literature, although almost every poet, Addison, Thomson, Gray, Wordsworth, Coleridge, Byron, Shelley, etc., has tried his hand at poetic drama, Elizabethan or classical.

#### Development of English Prose

The same idea of uniformity, of a definite but not too rigid pattern, "correctness," shaped the prose of Dryden, Temple, and their followers. The earlier prose of the 17th century had shared in the irregular greatness of the poetry. The prose of Francis Bacon's *Essays*, and *History* of Henry VII; of the great Anglican preachers, Lancelot Andrewes, John Donne, poet in prose as well as verse, Jeremy Taylor, of philosophical humorists as Robert Burton, *The Anatomy of Melancholy*, Thomas Browne, *Religio Medici*, and *Urn Burial*; the controversial pamphlets of Milton, as *Areopagitica*; the historical memoir-writing of Clarendon, *History of the Rebellion*—all illustrate the erudite, imaginative phraseology, the splendid but not perfectly controlled harmony, the too long and complex sentence-structure of a prose which enriched our language, but was not a fully developed and controlled medium.

A simpler style is traceable in the antithetic sentences of the character-writers, as Earle's *Microcosmographie*; the prose of moderate divines like Chillingworth, *The Religion of Protestants*, and Hales, *Golden Remains*; and the virile, well-girt style of the philosopher Hobbes, *Leviathan*. The strain of racy colloquialism in 17th century prose, coloured by a sensitive and imaginative temperament, and enriched by the sublimer phraseology of the English Bible, gives individuality to the *Grace Abounding* to the Chief of Sinners and *Pilgrim's Progress* of John Bunyan. A gentler temper sweetens the talkative prose of Izaak Walton's *Compleat Angler*, and *Lives*, and the multifarious, witty writings of Thomas Fuller. The new prose, colloquial but urbane and weighty, begins in the *Sermons* of Tillotson and South, the *Essays* of Sir William Temple, and, above all, in the prefaces and essays of John Dryden, whose

critical prefaces manifest, for the first time, the qualities of urbanity, of ease and elegance combined with force, which mark the prose of a people who have come of age socially and culturally.

The new instrument lent itself to all the purposes of an age in which political and social life entered into the closest union with literature. The first of these is satire; and the pamphlets and occasional pieces of Jonathan Swift, from *The Tale of a Tub* to the *Travels* by Lemuel Gulliver, made him a power in English political life, and revealed the greatest mastery of irony in the English or perhaps any other tongue. Richard Steele and Joseph Addison, pamphleteers on the other side from Swift, showed in *The Tatler* and *The Spectator* how the same style, used with less masculine vigour than in Dryden's, and less incisive virulence than in Swift's prose, but with a delightful blend of irony and "sweet reasonableness," might be made to inculcate good sense and purer manners on a society which still felt the evil effects of Puritan and Restoration excesses. *The Tatler* and *The Spectator* had many successors down to the end of the century, including *The Guardian* and Johnson's *Rambler* and *Idler*.

#### Birth of the Modern Novel

The first of modern novels in Western Europe was Cervantes' *Don Quixote*, whose fame was quickly diffused. The most interesting precursors of the novel in English were such varied products as the picaresque and sentimental extravagances of Aphra Behn's *Oroonoko* and *The Forced Marriage*; Bunyan's realistic allegories; Daniel Defoe's stories, which are almost the complete thing, e.g. *Robinson Crusoe*, *Captain Singleton*, *Moll Flanders*, *Captain Jack*; and the fantastic realism of Jonathan Swift's *Gulliver's Travels*. But a potent shaping influence was that of the press, which, beginning in the reign of James I, had developed in the *News Books*, *Mercuries*, etc., of the Civil Wars, the last phase of which was the *Newsletters* of Henry Muddiman and the fuller journalistic work of John Dunton and Daniel Defoe.

The man in whose work these various elements—realistic narrative, the minute portrayal of contemporary life and manners, the didactic interest in conduct—crystallised, finding their centre in the sympathetic analysis of a human soul passing through a moral crisis, was Samuel Richardson, whose *Pamela*, *Clarissa*, and *Sir Charles Grandison* created a type of novel

which has been more assiduously cultivated in France than in England. A different kind of plot, deriving from *Don Quixote*, full of adventures at inns, bringing together all sorts and conditions of men, a more masculine philosophy of life and conduct, made Henry Fielding, dramatist, essayist, and novelist, the father of a novel more characteristically English than that of Richardson. Joseph Andrews, *Jonathan Wild*, *Tom Jones*, and *Amelia* are the most genial and vivid pictures of English life which the 18th century has bequeathed.

#### Smollett and Goldsmith

He was followed by an ill-conditioned Scot of genius, Tobias Smollett, a sardonic and angry painter of sordid and violent life, the creator of some immortal types, as of the English sailor, in *Roderick Random*, *Peregrine Pickle*, and *Humphrey Clinker*. The tendency of the novel in Smollett's hands to revert to picaresque story was checked by Laurence Sterne, whose self-conscious sentiment and whimsical humour, which owed much to Rabelais, Montaigne, Cervantes, Burton, and Swift, found expression in *The Life and Opinions of Tristram Shandy, Gent.*, and the *Sentimental Journey*, a tour through France and Italy, tales which, following no plan, vindicated the right of the novel to take what form it please, so it mirror the idiosyncrasies of character and feeling. Among the followers of these great painters of manners is Frances Burney, with *Evelina*, *Cecilia*, and *Camilla*, while Johnson's *Rasselas* is but an expanded epilogue of the type of Addison's *Vision of Mirza*. Goldsmith's *The Vicar of Wakefield*, with its fanciful, humorous, pathetic picture of life seen through the idealising atmosphere of reminiscence, had an influence on Goethe and Continental writers hardly inferior to that of Richardson. In Horace Walpole's *Castle of Otranto* the first wave of the Gothic revival reached the novel.

The novel was only one channel of prose literature in the century. If the didactic spirit invaded and chilled poetry, the regard for form, for correctness, elegance and dignity of composition, gave artistic interest to work of kinds which a later age has too scrupulously divorced from literature. John Locke, *Essay concerning Human Understanding*, was a diffuse and cumbersome writer; but there are few finer practitioners in the prose of Dryden and Addison than George Berkeley, *Three Dialogues*, Alciphron, and David Hume, *Essays*. Johnson, poet, lexicographer, essayist, and critic, sacrificed the

lightness of Addisonian style for more force and dignity, not untouched with pomposity, qualities not more evident in his own work than in the record of his conversation preserved in James Boswell's *immortal Life*.

English prose acquires grace and charm in the work of Oliver Goldsmith, whose *Citizen of the World*, *Vicar of Wakefield*, and comedies have an unfading freshness. Edward Gibbon made the same dignified prose the purple vestment of his not more learned than splendidly ordered *Decline and Fall of the Roman Empire*. Edmund Burke, the most diffuse and gorgeous of English orators, combined with eloquence a unique intellectual and imaginative insight into the principles of politics, the mainsprings of man's social nature.

A didactic purpose, a regard for "correctness" within a narrow but widening pattern of diction and verse, are the accepted principles of English poetry to the time of Blake and Wordsworth, and even later. The beginnings of a change showed themselves first rather in an enlarged choice of subjects—Nature, the Middle Ages, Liberty, and the Natural as opposed to Civilized Man, and in some experiments in earlier verse forms, than in any radical change of spirit and style.

#### Augustan Conventions

James Thomson's blank-verse *Seasons*; John Dyer's octosyllabic *Granger Hill*; the essays in *Spenserians*, as Thomson's *Castle of Indolence*; Thomas Gray's *pensive Ode on a Distant Prospect of Eton College*, or *Elegy in a Country Churchyard*; and the equally pensive, less finished and sustained, but more spontaneous and sensitive odes of William Collins; the minor poetry of the Wartons, Thomas and Joseph, and of Mark Akenside; the poems, more Pope-like in form, of Dr. Johnson, as *The Vanity of Human Wishes*; Oliver Goldsmith's *The Deserted Village*, and George Crabbe's *The Village*, all show in different ways the change that is being effected, but are still quite Augustan in their conventional "poetic diction," their studied "correctness" in spirit and form; and so, despite their romantic themes, are Gray's more ambitious odes, *The Progress of Poesy* and *The Bard*.

But the new spirit was to find its proper style, to substitute for a poetic heightening of eloquence a style whose ideal is the free and natural outpouring of the heart. The frost is loosening in the poetic prose of Macpherson's *Ossian*, and



Chatterton's Rowley Poems, in Goldsmith, and in Cowper's *The Task*. It is broken up in the songs of William Blake, mystical poet and painter, Songs of Innocence, Songs of Experience, and in the Lyrical Ballads of Wordsworth and Coleridge.

The long poetical career of William Wordsworth was run in the fervour of imaginative and mystical insight into the life of nature and its significance for the soul of man, to which he had attained through the meditative country life of his youth and the spiritual agitations of the French Revolution. The *Prelude*, The *Excursion*, The *Recluse*, fragments of a never-completed autobiography and spiritual creed in blank verse; lyrical and narrative poems inspired by nature, childhood, the peasant, the affections, patriotic sonnets, have one common theme, and are composed in a style which Wordsworth was disposed to make something of a religion too—bald and prosaic and even awkwardly pompous when inspiration fails, at its best unique in passionate, imaginative simplicity. Coleridge's best poetry shows the influence of Wordsworth in thought and feeling and style, but what is most individual in *The Ancient Mariner*, *Christabel*, *Kubla Khan*, is not those Wordsworthian qualities, but the magic with which the reawakened sense of beauty and mystery is expressed in phrase and in subtle music of vowel and consonant and cadence.

#### Poetry of Scott and Byron

The spirit and art of Wordsworth's and Coleridge's poetry were too novel and elusive for immediate appreciation. Public taste had to be stimulated and purged by the more crudely romantic poetry of Walter Scott, Byron, and Thomas Moore. Scott's stirring but somewhat rococo lays are of less pure poetic worth than the delightful snatches of song in which he revived the impersonal, chivalrous note of medieval lyric. The fiery, brilliant, crude improvisations of Byron in lyric and lay, and the blend of description and rhapsody in *Childe Harold* are the unreflective, potent expression of the spirit of pure revolt in romanticism, but Byron's best work was satire in conversational style and *otava rima*, *Beppo*, *Don Juan*, and *The Vision of Judgment*.

Scott and Byron enjoyed a European reputation. They are the most human and worldly of the poets of the period: there is more passionate flesh and blood in Byron's technically inferior work than in the work of any of our poets

save Shakespeare and Burns. The "desire of the moth for the star" is the burden of the lyrical dramas, *Prometheus Unbound* and *Hellas*, rhapsodies as *Alastor*, and elegiac poems as *Adonais*, and the songs in winged and ethereal rhythms of Percy Bysshe Shelley. Beauty, the beauties of nature, of Spenser's poems, of medieval chivalry, of Greek mythology and art, of Miltonic cadences and Shakespearean phrases, are the theme and inspiration of the *Endymion* and later poems and odes of John Keats. The curiously carved *Gebir*, *Hellenics* and *Lyrics* of Walter Savage Landor are inspired by a like sense of the statuesque beauties of Greek poems and epigrams and by a finer scholarship, if a less spontaneous creative genius.

#### The Revolutionary Novel

The last great novelist in the 18th century school of manners and character was Jane Austen, whose *Northanger Abbey* was an early skit on the new romantic novel. Her exquisite pictures of genteel English life in the country and at Bath include *Pride and Prejudice*, *Emma*, and *Persuasion*. But the novel, too, came under the influence of the taste for romantic scenery, a medieval atmosphere, the marvellous and mysterious, dreams of the perfectibility of human nature and political regeneration. The result is seen in revolutionary novels as William Godwin's *Caleb Williams*; didactic stories like Thomas Day's *Sandford and Merton* and Miss Edgeworth's tales; Mrs. Radcliffe's tales of mysterious adventures, *The Mysteries of Udolpho*; crude experiments in historical fiction as Longworth, Earl of Salisbury, Clare Reeve's *The Old English Baron*, Jane Porter's *The Scottish Chiefs*. Maria Edgeworth's *Castle Rackrent* and other tales extended the study of manners to the Irish gentry and peasants.

These and the historical stories are interesting now only or mainly as marshalling the way to the great achievement in the *Waverley Novels*, from *Waverley* to Count Robert of Paris, of Sir Walter Scott, who combined and harmonised the interest in character and manners of the great 18th century novelists, the romantic passion for other times and other manners and for a picturesque setting in scenery rich in historical associations, and that respect and affection for the peasantry which had grown steadily throughout the 18th century from Thomson and Gray to Rousseau and Burns and Wordsworth.

The influence of the romantic

movement on prose work other than the novel can be studied in the picturesque, archaically coloured prose essays and Elizabethan critical studies of Charles Lamb, *Essays of Elia*, *Specimens from the Dramatic Poets*; in the vivid, passionate, impressionistic essays and criticism of William Hazlitt, *Lectures on the English Poets*, *Lectures on the English Comic Writers*; in the cadenced prose, musical and fanciful, of Thomas De Quincey, *The Confessions of an Opium Eater*; and in the pleasant chat about letters and art and scenery of Leigh Hunt, *The Examiner*, etc. William Cobbett's racy, idiomatic prose, *Rural Rides*, continues the tradition of South and Swift.

The poetry of the reign of Queen Victoria is a continuation and elaboration of the romantic revival. The chief themes are the same—Nature, the romantic past, medieval and classical, the problems of life and death. There is less of the suggestion of a prophetic burden (that is taken over by prose writers like Carlyle and Ruskin) than in Wordsworth and Shelley, more of consciously artistic handling, of antiquarian accuracy of reproduction, of analysis and inquiry, of dramatic interest which, except in Scott, had been somewhat overshadowed by the large topics—Nature and Liberty and Romance. The purification of style, the rejection of a stereotyped convention in poetic diction, had led to an enrichment of phraseology, a more imaginative style that owes much to older poets, and in the elaboration of which Keats is a principal agent, and Keats's influence is obvious in all the Victorians.

#### Tennyson and Browning

The most representative poet is Alfred Tennyson, whose careful experiments in the artistic expression of moods culminated in the two volumes of 1842, lyrics and idylls of nature and English rural life, of character, *Simon Stylites* and *Ulysses*, of medieval and classical legend, and of the problems of sin and death and immortality, *The Vision of Sin*. In the years which followed the style thus studied and mastered became the medium of longer, more ambitious, not always entirely successful poems, *The Princess*, *In Memoriam*, *Idylls of the King*, jewelled settings of tales from Malory and the *Mabinogion*, touched with modern feeling. Tennyson's later ballads and idylls reflect with great but unequal power his passionate patriotism and the trouble of soul with which he contemplated the changing spirit of his age.

A wider dramatic range, a more curiously analytic mind, a more colloquial style, and a less melodious but more varied verse distinguish the not essentially different dramatic monologues and lyrics of Robert Browning. The long and somewhat chaotic and obscure poems, of which the happiest is *Paracelsus*, were followed by experiments in dramas intended to be acted (as some were), and then Browning found himself in a series of shorter dramatic lyrics and monologues, beginning with *Pippa Passes* and closing with *Dramatis Personae*. The longest of his dramatic, analytic studies of the human soul, *The Ring and the Book*, was followed by many similar studies, subtly intellectual but more fully inspired.

As a revival of the life and art and spirit of past times the movement which began in the 18th century culminated in the exotic, cultured poetry of the middle of the 19th century. But this poetry also reflects that change of spiritual temper which troubled Tennyson and Browning, on the one hand the revival, actual or artistic, of medieval Catholicism, on the other the Lucretian philosophy of life to which modern science tended.

#### Learning and Lyrical Inspiration

In this philosophy, in the poetry of Greece, in Goethe and Wordsworth, Matthew Arnold found the inspiration of poems, lyrical, narrative, and in Greek dramatic form, with a piercing elegiac note of their own. Medieval art, early Italian poetry, Keats and Browning were the influences which shaped and coloured the ballads, monologues, sonnets, and lyrics, sensuous, mystical, and elaborate, of Dante Gabriel Rossetti. Early French poetry, Froissart and Chaucer, Rossetti and Browning, the architecture and decorative arts of the 12th and 13th centuries, the passionate, stoical heroism of Icelandic myth and saga, a socialism which is in part an artist's hatred of modern machinery and commerce, are the blended strains in the lyrical and narrative poetry and prose of William Morris, reteller of stories classical and northern after the manner of Chaucer, but without his humour.

A deeper sympathetic comprehension of the spirit, but even more of the form, the metrical complexities and beauties, of Greek poetry, superior to that of Gray, perhaps even of Milton, for Milton was limited by the scholarship, more Latin than Greek, of his day; an equally intimate know-

ledge and understanding of French poetry from Villon to Victor Hugo; a love amounting to idolatry for Shakespeare and the Elizabethan dramatists—are the sources of the poetry, decorative and intoxicatingly harmonious, of Algernon Charles Swinburne. Never have learning and lyrical inspiration been more strangely blended; never has poetry so spontaneously lyrical been so purely literary in its sources and motives.

#### Old Forms and Modern Feeling

To this school belongs the intimate, ascetic, religious poetry of Christina Rossetti; and one of the most remarkable products of the tendency to find inspiration in the past and adapt old forms to modern feeling is Edward Fitzgerald's *Rubaiyat of Omar Khayyam*. There is no room here to speak of lesser work, as Keble's *The Christian Year*, the *Lays of Lord Macaulay*, the *Festus of Bailey*, the poetry of Taylor, Alexander Smith, Sidney Dobell, and Arthur O'Shaughnessy, or the lighter verse of William Edmondstoune Aytoun, C. S. Calverley, and Lewis Carroll.

Among the many prose writers other than novelists of the early and middle century, historians like George Grote, *History of Greece*; Lord Macaulay, *Essays, History of England*; James Anthony Froude, *History of England*; philosophers as John Stuart Mill, *Logic, On Liberty, Utilitarianism*; and Herbert Spencer, *Principles of Psychology, First Principles*; theologians and religious writers as John Henry Newman, *Apologia pro Vita Sua, Grammar of Assent*; critics of literature and art as Matthew Arnold, *Essays on Criticism*; and Walter Pater, *Studies in the History of the Renaissance*, Marius the Epicurean, *Appreciations*, two stand out most vividly. The first is Thomas Carlyle, the tormented, passionate, eloquent prophet of duty and work, whose Sartor Resartus is at once a spiritual autobiography and a philosophy, following Swift and Burke, of the clothes, political and religious, in which the human spirit is ever concealing its "shivering nakedness," only to find them grow old and drop away, if not burnt up in Protestant Reformations and French Revolutions, and to begin again to weave them in time's tireless loom.

In the French Revolution Carlyle portrayed, with an amazing vividness of dramatic and cinematographic presentation, an era of dissolution and rebirth, the flaming apparition of modern democracy.

In *Heroes and Hero-worship*, *Cromwell's Letters and Speeches*, and *History of Frederick II*, he dilated upon and dramatically reconstructed some of those great spirits who, penetrating to the reality which underlies the illusions of life, are the true leaders of men.

The reference to current events which runs through all his work found clearest expression in *Chartism Past and Present*, and *Latter Day Pamphlets*. The other Victorian prophet is John Ruskin, the more musically eloquent expounder of art, painting and architecture, in its relation to the moral nature of man and the ordering of society. Modern Painters, *Seven Lamps of Architecture*, *Stones of Venice*, *Unto this Last*, *Sesame and Lilies*, *Fors Clavigera*, *Preterita* are among the principal works which brought art into a closer relation with literature than had ever been done before in England, and trace the troubled progress of a great and sensitive soul. A less prophetic but equally prejudiced and individual writer of the period was George Borrow, the first interpreter of the Gipsy character, and a writer of natural, racy prose, *Lavengro*, and *The Romany Rye*.

#### Dickens and Thackeray

The Victorian novel resumed with certain definite limitations imposed upon it by the moral taste of the time, the work of the great 18th century novel, the serious and humorous portrayal and the active criticism of contemporary life and manners, with occasional digressions into the historical. Charles Dickens, humorist, sentimentalist, pictorial describer and dramatic, not to say melodramatic, narrator, social critic and reformer, began with *The Pickwick Papers* a series of novels and tales that enthralled the readers of the world. The greatest are probably *Pickwick*, *Nicholas Nickleby*, *Martin Chuzzlewit*, *David Copperfield*, and *Great Expectations*. *Barnaby Rudge* and *A Tale of Two Cities* are historical novels, the latter coloured by the reading of Carlyle's *French Revolution*. Dickens's favourite subject was the character and manners of the lower middle classes.

But the most penetrating critic of the devastating snobbishness of English upper class society, never worse than at this time, when wealthy merchants were pressing for aristocratic recognition, was William Makepeace Thackeray, the most unerring portrayer since Fielding of human nature as it is.

the novelist who gives us no heroes. *Vanity Fair*, *Pendennis*, and *The Newcomes* are, with his shorter sketches, the greatest of his novels of contemporary life. In *Esmond*, and in a lesser degree in its sequel *The Virginians*, the same delicacy of satirical and sympathetic portraiture is given an historical setting of wonderful comprehensiveness and atmosphere. The early sketches of provincial life by George Eliot (*Marian Evans*), *Scenes from Clerical Life*, *Adam Bede*, *The Mill on the Floss*, *Silas Marner*, and *Felix Holt*, have a freshness and power that somewhat failed her in the later more learned and philosophical works, *Romola*, *Daniel Deronda*.

#### Propaganda through the Novel

The tendency to make of the novel a political, social, or ethical and religious pamphlet, which is obvious in Dickens's works, though constantly transcended by his buoyant humour and creative power, is dominant in the brilliant political novels of Benjamin Disraeli, *Coningsby*, *Sybil*, *Tancred, Lothair*, and *Endymion*; in the ardent and vivid pictures of contemporary and past problems and agitations of Charles Kingsley, *Alton Locke*, *Hyppatia*, *Westward Ho!*, and *Hereward*; and in the stories of Mrs. Gaskell. *The Bror tésisters*, *Charlotte and Emily*, poured into the same form, *Jane Eyre*, *Villette*, *Wuthering Heights*, the lyrical record of their own lives and passionate thoughts. Anthony Trollope, with his delightful sketches of clerical society, *Barchester Towers*, *Framley Parsonage*; Charles Reade, ardent social reformer, *It Is Never Too Late to Mend*, *The Cloister and the Hearth*; and Lord Lytton, experimenter in all kinds of novels, *The Caxtons*, *My Novel*, *The Last Days of Pompeii*, *A Strange Story*, are typical Victorian novelists.

#### H. J. C. Grierson

Literature constantly renews itself, or it would not be literature, and a renewal began in the 1870s. Poets and novelists betrayed a certain restlessness, as if their genius needed fresh air. George Meredith (1828-1909), having studied German transcendentalism, brought this philosophy into his best work. There is something cosmic in his poems, which celebrate the spirit of life pervading the whole creation. If man ignores this unanimism, he does so at his peril. Such was the burden of his novels, which present one or more human beings insensible to these influences, absorbed in their own social or sentimental prejudices and thereby lost

to that saving sense of humour which Meredith defined as "intellectual laughter" (*Beauchamp's Career*, 1876; *The Egoist*, 1879; *Diana of the Crossways*, 1885).

Thomas Hardy (1840-1928) knew nothing about people who use their wits to push their way, but everything about the humble folk who pursued their immemorial callings in "Wessex." These simple characters were not the types to create a plot; the plot had to create them; that is to say, he had to manoeuvre them into the kind of situations which give his well-constructed novels their atmosphere of suspense and pathos. So they became figures of high drama, the victims, not of the "tragic error," but of the "tragic fluke." This sombre and ironical interpretation suited his temperament, already burdened with Darwinism, but darkened his artistic consciousness. Nevertheless, his best novels (*The Return of the Native*, 1878; *The Woodlanders*, 1887; *Tess*, 1891), redolent of Old England, breathe a rustic atmosphere such as only a poet could create. His eleven volumes of verse (from 1898) are unmistakably individual and intimate, the tone either ironical or meditative, the thought slimmed down to the least ornamental expression. *The Dynasts* (1904-08) is still the same Hardy seen against an epic background.

R. L. Stevenson (1850-94) believed that the charm of literature survived in its form and style, not in its content. He cultivated a freshness and grace which transfigure the most ordinary subjects. He began with essays and sketches (*Travels with a Donkey*, 1879), until he discovered that he could write tales of adventure, and that thereby he could liquidate the obsessions of his Calvinistic training—his horror of evil—picturing the folly of wickedness and the wickedness of folly in dramatic and spirited narratives, touched with humour as well as psychological insight (*The Master of Ballantrae*, 1889; *Weir of Hermiston*, 1906).

#### Late Traditionalists

Oscar Wilde (1856-1900) was more outspoken and provocative. He appealed to his generation to stop making money out of others and begin making a work of art out of themselves. This was the basis of the "aesthetic movement" which Wilde expounded in his essays. In his comedies (*Lady Windermere's Fan*, 1892; *The Importance of Being Earnest*, 1895) he represented (not caricatured)

those who had the leisure but lacked the brains to be aesthetes.

These authors were ready enough to break with puritans and philistines, but not to break with tradition. The same is true of a group who aimed at discrediting the laxity of current speech. Charles Doughty (1843-1926) gave them the lead (*Arabia Deserta*, 1888; *Epic Poems*, 1906-20); but the outstanding figure is Robert Bridges (1844-1930). It was his life work to give wider and deeper scope to English humanism, as he reaffirmed in *The Testament of Beauty* (1929), a long didactic poem, compact of scholarship and philosophy. Gerard Manley Hopkins (1844-89) went even further. He readapted the old arts of stress, sprung rhythm, inscape, and archaic phraseology till they became a technique peculiar to himself wherewith to suggest a height of religious ecstasy or a depth of despair, attempted only by Dante. Lancelles Abercrombie (1881-1938) is akin to this group. He was somewhat a mystic, gifted with a keenly sensitive ear and a discerning sympathy with human nature, over-anxious to borrow the spirit and persuasiveness of the 17th century.

#### Kipling the Many-sided

Strange as it may sound, the archaic school had much in common with Rudyard Kipling (1865-1936). This dogmatic and impulsive writer has been frequently misjudged because of his many-sidedness. Born and bred (though not educated) in the ancient civilization of India, he was sensitive to supernatural influences, a primitive at heart. Being an acute observer, and an inveterate globe-trotter, he studied the significance of mechanised civilization at first hand and was astonished at the inventive adventurous spirit of man renewing itself in wondrous and godless ways, forgetful of eternal law. Nations as well as individuals were being subjected to a crucial test. It was only human that he should believe that imperial England was the divinely appointed pioneer and moderator. So he started his series of ballads, verse monologues, and picturesque prose tales, employing the old swinging metres, the old objective narrative manner, and the old diction, except where dialects and colloquialisms could appropriately be introduced, again after the fashion of pre-Renaissance authors. His vigorous racy style has a tang of its own, yet his convictions remind us of the Bible and of Bunyan.

Moreover, throughout his life he cherished a nostalgic sympathy with the older more permanent issues, for instance boyhood, the charm of animals, folklore, the mother-wit, fortitude and folly of the primordial adventurer (*Jungle Books*, 1894-95; *Captains Courageous*, 1897; *Kim*, 1901).

John Masefield (b. 1878) was much influenced by Kipling. He had a similar aptitude for the country scene, and zest in the spectacle of human energy and, like his master, imposed these qualities on unpoetical themes, adapting his vocabulary to his characters with the utmost freedom (*The Everlasting Mercy*, 1911). But at heart he was a conventionalist, and, having established his artistic independence, he reverted to the manner of Chaucer, and was at his best portraying English pursuits and pastimes "in places where the will to live clothes itself in lovely shapes."

#### Neo-Georgian School of Poetry

There were other poets who avoided both the archaic and the Kiplingesque schools, because the one made poetry too difficult and the other made it too easy. These—the so-called neo-Georgians—contented themselves with the simplest pleasures, enjoyed in the most natural ways, relieved of Victorian luxuriance and sentiment. The most representative of these are Rupert Brooke (1887-1915), who achieved the right note of intimacy and contentment, and James Elroy Flecker (1884-1915), who modelled his technique on the clarity and compactness of the Parnassians.

The neo-Georgians, as a whole, produced little effect because they made no discoveries. They expressed only themselves. They might have learnt much from Walter De La Mare (b. 1873), who began by writing prose and verse in the vein of childhood, and then disciplined his imagination to range over the mysteries haunting the consciousness of adults. In his novels (*The Return*, 1910; *The Memoirs of a Midget*, 1921), he poses a whimsical situation which develops into an allegory of human experience. His mature verse, at its best, is steeped in melancholy, now and then illuminated by touches of exquisite beauty.

At this turning point in English history, it is remarkable that the vast majority of authors practised fiction. They had the example and authority, first, of Henry James (1843-1916), who taught himself how to concentrate on the one outstanding character and organize his

personality, bit by bit, till the reader gradually perceives its mainspring—some idea or ideology which makes him what he is; second, of George Moore (1852-1933), who began as a realist and ended as the re-creator of realism, projecting his own knowledge of life into some historical personage and readjusting the facts so as to express his artistic sense of composition, rhythm, fitness and human dignity. Arnold Bennett (1867-1931) would gladly have learnt their lesson. He aimed at truth to life, provided that the author was also true to himself. Between 1908 (when his masterpiece *The Old Wives' Tale* appeared) and 1916, he was inspired to draw his material from the drab, industrialised society of the Five Towns. These reminiscences, being part of himself, gave scope to his genius. His other 60-70 publications, except *Riceyman Steps* (1923), can hardly be classed as serious literature.

The career of John Galsworthy (1867-1933) is not dissimilar. In his first masterpiece (*The Man of Property*, 1906) he relived his own ten years of "ecstasy and torture," transposed into the impersonal, objective realm of art. Having purged his own soul, he had eyes to see how others, in fact his whole class, were confined to a gilded prison, frozen in prosperity. Hence his next three novels and his three remarkable plays (*The Silver Box*, 1906; *Strife*, 1909; *Justice*, 1910) which reveal the injustices of English plutocratic democracy, and the dramatic possibilities of undramatic facts. The popularity of *The Forsyte Saga*, 1922 was immense and immediate. He also produced 17 more plays, of which *The Eldest Son* (1917) and *The Skin Game* (1920) are the most convincing. But none of his works after the *First Great War* is written with his blood. They have only the humour and humanity of a man whose battle is won.

#### Conrad's Dramatic Sea Stories

Joseph Conrad (1857-1924), who knew no English till he came of age, scorned the conventional topics of British fiction. Relying on his study of Russian and French novelists and 20 years of cosmopolitan sea-travels, he dived into his own heart, and put what he found into the heart of some figure glimpsed in passing, years ago, and remembered because suggestive. Acting on a hint, he recreated the impression, till it grew into a drama of perseverance and perversity. In this

spirit he produced some austere yet vivid masterpieces (*The Nigger of the Narcissus*, 1898; *Lord Jim*, 1900; *Typhoon*, 1902).

E. M. Forster (b. 1879) might be considered Conrad's exact opposite, except that he is an equally conscientious artist, no less alive to the influence of atmosphere. He is chiefly interested in the normal educated human being who adjusts his conduct to the moral and social environment, but also has (or ought to have) a soul accountable to no one, not even to himself. As such evenly balanced temperaments are rare, Forster became an expert in portraying those who unsuspectingly miss their place, either in society or in their own hearts; and he enjoyed manoeuvring them into cleverly contrived embarrassments and inconsistencies. Generally he developed his comedy and criticism out of studies in the routine of English middle-class life (of which *Howards End*, 1910, is the best); but curiously enough his first and latest important works (*Where Angels Fear to Tread*, 1905; *A Passage to India*, 1924) dissect human nature on a background of racial and international misunderstandings. As he tells his stories in the old objective manner, without explanation, many a reader is unprepared for their spiritual implications. No one is likely to undervalue their classic style.

#### Walpole and Wells

His quality becomes apparent when he is compared with Sir Hugh Walpole (1884-1941), who also wrote in the accepted Victorian manner, and understood as well as Forster did that every human being worth a novel has to live down his past or conquer his future. Walpole began well, but this tension gradually took such hold of his imagination that he came to depict, or even personify, evil as a malignant force, often looking for it where it could not be found. This satanism vitiates even his best sustained effort, *The Herries Chronicle* (1930-33).

H. G. Wells (1866-1946), on the other hand, began simply by trying to interest others in what interested him. Hence arose his series of scientific yarns, admirable in their inventiveness and touches of humour. He soon perceived that these extravagant romances might sooner or later become alarming realities, for which people were quite unprepared. Hence his stories on social, educational and administrative problems, of which

Kipps (1905) and *The History of Mr. Polly* (1910) are the least ambitious and the most enduring. Having exposed, according to his view, the apathy and muddle-headedness of Edwardian England, he had the courage and confidence to offer the remedy in his discursive and brightly written essays in the reconstruction of knowledge in order to reconstruct civilization. In his later works he was obsessed by the crisis in human affairs.

W. Somerset Maugham (b. 1874) is another story-teller who seasoned the ancient art with contemporary ingredients. But while Wells tried to reform his contemporaries, Maugham tried to reform the way of looking at them. Science interprets, art and philosophy reinterpret. He did not, however, fully master this principle until he applied it to his own life in the disguised autobiography *Of Human Bondage* (1915). His narratives move rapidly and unexpectedly, and he uses his subsidiary characters to reflect the surprises he springs on his readers. This dramatic concentration is all the more effective because Maugham is also an accomplished playwright, skilled in the mass-psychology of the theatre.

#### Recrudescence of Drama

The recrudescence of the drama, inaugurated in the late 'eighties by Pinero, Hankin, Davies, H. A. Jones, and Wilde, influenced by Ibsen, G. Craig, and the Irish National Theatre Society, during the 20th century drew into its practice novelists and poets of note, as well as a group of professional dramatists, including Stanley Houghton, Harley Granville-Barker, St. John Ervine, Lord Dunsany. By far the most prolific and technically expert was Sir James Barrie. But all were overshadowed by Bernard Shaw (b. 1856). Shaw believed so wholeheartedly in the perfectibility of man that he believed man could perfect himself simply by sharing the good things of this world, including its poetry and music. Since this rectification could be attained only through Fabian socialism, and since anti-socialism was muddle-headedness or class-prejudice, the obstructionists had only to be presented before the footlights and they would soon laugh themselves out of court. He quickly learnt that stage socialism connoted or denoted other kindred demands on clear-headedness. Accordingly he widened his scope. At the back of his comedies there emerges what he regarded as some

economic, religious, or sentimental fallacy, and in the foreground its adherents and dissidents think aloud. All are contemporary types (even the historical characters), with just enough actuality to persuade an audience that it is listening to its own opinions. His first masterpiece is *Candida* (1895), but he did not become popular till *John Bull's Other Island* (1904). Thereafter his plots became less continuous and more speculative, but he returned to his best manner in *The Doctor's Dilemma* (1906), *Androcles and the Lion* (1912), and *Saint Joan* (1923). Shaw is an expert in human contrasts and incongruities, and has at times an audaciously felicitous sense of stage effects. He did much to abolish what he called "footlight sensations" and to inspire a new school of acting. To appreciate Shaw fully it is, of course, necessary to read his prefaces, written in English of an uncommon lucidity, as well as the plays themselves.

#### Poets of the First Great War

The First Great War brought a new orientation, most clearly revealed, as always, in poetry. The war poets began with an outburst of lyrical and patriotic fervour (Charles Sorley, Julian Grenfell), but soon changed their tone to outspoken disillusionment and bitterness (Wilfred Owen, Siegfried Sassoon). They wrote, for the most part, in the old manner, but with a new licence of speech. Others of the younger generation felt that poetry should be a sheer effort of creative energy which fulfilled itself in the ardour of composition, personal and spontaneous, the words extemporising the thoughts. Therefore if the imagination was to enjoy the freedom of a dream, the prosody must be free also, not confined to the discipline of metre. The spirit should find vent in cadences which rose and fell with the flow of words, as in emotional prose. This cult became the recognized technique for many who wanted to leave the shattered world behind and start afresh, beginning with the experience of themselves.

There was much to encourage their spontaneity, which ended in iconoclasm. Study of anthropology and folk-lore had demonstrated that man is the legatee of a very ancient inheritance still potent in his racial memories and primitive susceptibility to seasonal and astral influences, and the call of sex. Twentieth century scientists disclaimed Victorian certitudes, hinting that man resists the

vagaries of evolution and follows appetencies which are all his own. Sigmund Freud (1856-1939) developed the theory that man lives two lives within himself, one an intellectual superstructure, the other a dark subterranean stream, perhaps prehuman in origin, which pervades his senses, creeping upwards into his dreams and affecting his sexual affinities. If all this is so, the artist cannot truthfully portray human nature until he has explored this interplay. Hence the "internal monologue" between the conscious and subconscious selves running concurrently through the same brain.

These ideas came as a revelation and a release to the more restless and inquisitive spirits of the time. D. H. Lawrence (1885-1930), bent on self-realization, plunged almost blatantly into the mysteries of sex attraction and the acquired relationships which unsettle the current of human existence (*Sons and Lovers*, 1913), persuading himself that man is not complete until he sinks his spirit in the "mindless creative stir of universal nature," the "otherness" which fuses yet rescues his soul (*The Rainbow*, 1915). These disturbing novels have narrative power, and his sense of atmosphere is unique. His later cosmopolitan novels are filled with wild, grandiose scenery, and a penetrating curiosity in the course of civilization far from Europe (*The Kangaroo*, 1923; *The Plumed Serpent*, 1926). He has written fascinating travel-books and much rhythmic unmetrical verse, for which he justly claims "the insurgent naked throb of the instant moment."

#### Joyce's Use of "Internal Monologue"

The revelation which Lawrence sought in the instincts and impulses of the blood stream and ganglia, James Joyce (1882-1941) sought in unspoken speech which expresses the germs of thought and feeling as inconsequentially as they enter the brain. Language was the indispensable and peculiar implement of the human *psyche*, which by its mere functioning betrays the ferment and confusion underlying conscious utterances. Moreover, this functioning, like any other mechanism, obeys its own universal laws. So what is true of one human being is true of all others, in principle. If it were possible to accompany a single specimen in his ruminations through the round of a single day the secrets of the human process would be revealed; yes, even of Homer's Ulysses. So the author of

The Portrait of the Artist as a Young Man (1916) eventually published *Ulysses* (1922), the most elaborate and erudite demonstration of what the internal monologue can achieve.

Virginia Woolf (1882-1941) must have been influenced by Bergson and Proust, as well as by Joyce. Her characters are made to dream or ruminate in such a way that their past survives in their present stream of consciousness, and their moods are deeply coloured by their spiritual and social contacts. Her novels are remarkable each for its invisible unity as well as its clairvoyance. This subtle effect was achieved by a life-long process of trial and error, easily traceable in Mrs. Dalloway (1925), *To The Lighthouse* (1927), *The Waves* (1931). Her style has a rhythm and sensitivity which are peculiarly her own.

#### Technique of Shock

Other writers felt so keenly the lack of spiritual sympathy and inwardness among their readers that they made their appeal through the senses and sensibilities, cultivating a technique which should produce a shock of surprise, and sting their blurred perceptiveness to life; for instance, Edith Sitwell (b. 1887), the most gifted English poetess of her time, for years relied on "sense-transfusion" (or "confusion"), the power of open vowels, verbal music, and recurrent phrasing. Her two brothers, Sir Osbert (b. 1892) and Sacheverell (b. 1897), in their cosmopolitan essays and travel books dwelt on surviving relics of beauty and strangeness. Yet others were so convinced of the prevalence of evil that they wrote about little else.

Of these, the most remarkable is Aldous Huxley (b. 1894), who made his reputation with cynical, witty, and cleverly contrived novels about people in prosperous social groups. In his second period, his graphic short stories and travel books began to hint at an enlightened code of self-discipline not uninfluenced by the ancient religions of the East. The Second Great War revived his cynicism and he projected his disgust into, for instance, *After Many a Summer*, 1944. His three early volumes of verse, though neo-Georgian in form, are charged with the nostalgic and apprehensive melancholy which his later experiences confirmed.

The writer who most fully absorbed all these conflicting

tendencies and yet has gone furthest towards spiritual integration is T. S. Eliot (b. 1888). He began with descriptive satires as clear-cut as any Imagist could desire, yet suggesting the undercurrent of unbidden thoughts and the spontaneous cinema-like train of impressions, as attempted by the masters of the internal monologue. Though not technically a practitioner of free verse, he moved with equal freshness and freedom (*Prufrock and Other Observations*, 1917; *The Waste Land*, 1922; *The Hollow Men*, 1925). Though his ruminations appeared to be improvised, he worked into them a wealth of erudite allusions and figures, as if to remind readers that his inspiration sprang of its own accord out of the common heritage of culture: and in his prose-criticism (*The Sacred Wood*, 1920), he argued that to preserve tradition is to continue its spirit of inventiveness and adaptation. Yet he was as ready as any "modernist" to spring surprises on his reader. He maintained an attitude of impersonal yet scathing disapproval of his age, gradually, however, becoming more contemplative, almost devotional, and more obscure. In *Ash Wednesday* (1930), he indicated a spiritual struggle to escape from his irritated misanthropic lower self into the upper air of realities, where the spirit can breathe. In his series of elegies *Burnt Norton* (1936) to Little Gidding (1942), the poet seemed to be on the verge of discovering his true bearings in place and time.

#### Seekers after Truth

W. B. Yeats (1865-1939) began by reviving Irish folk-lore and legendry as being the only sure approach to what is deepest and most permanent in human nature. What he found there he projected into romantic epics, symbolical (not symboliste) dramas, and continued to proclaim in persuasive prose. In middle-life he mixed more with the world, and learnt to clarify his imagery and restrain his intensity in more vivid and concentrated lyrics (*Responsibilities*, 1914) and in more realistic drama (*The Player Queen*, 1922), yet without sacrificing his imaginative ways of expressing himself. Still the same Yeats, he finally succeeded in achieving verse that is "hard and dry" (*The Tower*, 1928; *The Winding Stair*, 1929).

These authors were adventurers, seeking truth above or below the surface of life. Others found quite enough adventure on the

surface itself. For instance Lytton Strachey (1880-1932), the complete humanist, portrayed 19th century personages as they would have appeared to the 18th, and ought to appear to the 20th; that is, as the victims rather than the victors of their public life (*Eminent Victorians*, 1918; *Queen Victoria*, 1921). By his insistence on the littleness of the great, he showed biographers how to practise the cunning of the novelist within the restrictions of the historian. In the 'thirties, some of the younger poets, unsympathetic or unequal to the flights of their elders, cultivated simplicity of outlook, studying their own personal reactions to what they loved in nature, other people, and themselves, including the spirit of fellowship which ought to unify a generation verging towards communism. A similar sense of common humanity appeared to satisfy such accomplished novelists as Howard Spring (b. 1889), J. B. Priestley (b. 1894), Charles Morgan (b. 1894), who maintained something like the range and manner of Dickens, Thackeray, or Meredith.

H. V. Routh

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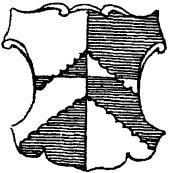


**English River.** Estuary on the W. side of Delagoa Bay, in Mozambique, E. Africa. It is formed by the union of the rivers Umbelosi and Tembi.

**Englishry.** Term used in early English law. The presentment of Englishry was the offering of proof, in cases of violent death, that the person killed was an Englishman, not a Norman, as, if a Norman was killed, the community had to pay a fine. This collective punishment was abolished in the time of Edward III. The term was also used by Macaulay and others for the English settlers in Ireland.

**English-Speaking Union,** THE. An Anglo-American club. Founded in 1918 by Sir Evelyn Wrench "to draw together in the bond of comradeship the English-speaking people of the world," it is the oldest and largest organization of its kind, and has an autonomous sister society working in the U.S.A. The membership of the British society, including branches in the dominions and colonies, was 18,500 in 1946, that of the E.S.U. in the U.S.A. being 14,000. It publishes a bi-monthly magazine, and its activities include the provision of hospitality for American visitors to Great Britain, and the promotion of lectures. Its address is 37, Charles Street, London, W.1.

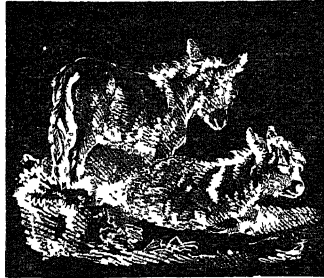
**Engrailed.** In heraldry, a line of division, or an outline of a charge, of irregular form, showing a series of semi-circles, with points outwards. The word, from Fr. *grêle*, hail, literally means cut into points like hailstones.



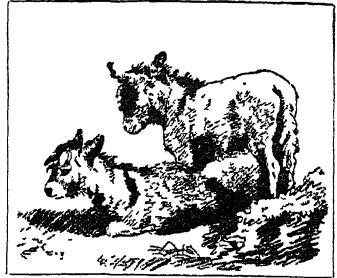
Engrailed in heraldry

**Engraver Beetle OR BARK BEETLE** (*Scolytidae*). Group of small cylindrical beetles, of which there are numerous species. Most of them burrow under the bark of trees, where the female lays her eggs in a straight tunnel, from which the grubs burrow out at right angles. Most of the species are extremely destructive, causing much damage to the forests of the U.S.A. and Europe. See Beetle.

**Engraving.** (1) Art of drawing on metal or wood by means of an incised line; and (2) impression in ink obtained from such drawing on paper or similar substance. In wood engraving the lines to be printed appear in relief, the wood between them being cut away. In the metal process, known as *intaglio*, the lines are sunk or incised



Engraving. Example of stippled engraving on copper of a sketch by G. Morland. Left, the copper plate on which the design was engraved. Right, the impression



by means of a graver or burin. The latter implement is a steel rod, four or five inches long, of square or lozenge section, with a cutting point and edges obtained by sharpening the head in an oblique section. There are various forms of wooden handle, the commonest one resembling an elongated half pear.

Plates of several different metals have been used for intaglio engraving: copper, steel, zinc, iron, silver, and even brass and pewter. Copper and steel, however, and especially copper coated with a thin layer of galvanised steel, are by far the most common. Pure copper is softer and easier to work than pure steel, but for the same reason does not wear so well under the press as the harder metal, and so does not throw off as many good impressions. The use of steel plates, though less ductile, was developed during the 19th century on account of their greater powers of resistance, until the copper plate covered with galvanised steel was substituted for them.

Wood engraving is really wood cutting, and so does not come within the scope of engraving proper. Lithography, which is a form of engraving on stone, is dealt with

under that title. The lines of an engraving on metal are often modified by the use of the etching needle, but etching, although a branch of engraving, differs from it in so many respects that it constitutes a separate art. The line of the graver, for example, is obtained by direct pressure upon the metal, whereas the etching needle is used in much the same way as a pencil, the subsequent incision being obtained by the "biting" of the acid on the plate.

There is evidence of the existence of wood-cut playing cards as early as 1440, but the earliest extant intaglio engraving, a "Flagellation" belonging to a Passion series in the Berlin Museum and attributed to a master in Upper Germany, is dated 1446. This disposes of Vasari's story that the invention of the art was due to Maso Finiguerra, the Florentine goldsmith and niellist, in 1460: there is reason to believe that even in Italy the art was being practised at least as early as 1450. Maso, however, may serve as a starting point for the history of that school of Italian engravers that arose directly out of the niello workers of the 15th century. At



Engraving. Wood block of a drawing by Harrison Weir, after Sir E. Landseer. Left, the wood block on which the outlines showing white are raised to catch the ink and make the black lines in the finished result shown at the right

first the taking of impressions from the gold and silver plates engraved according to the niello method by the goldsmith or silversmith was, doubtless, for the sake merely of checking his work; later as the artistic value of the impression itself became evident the scope of engraving was extended.

Among famous Italian painters of the 15th century who practised engraving were Antonio Pollaiuolo and Andrea Mantegna (*q.v.*) and Marco Antonio Raimondi, the engraver of Raphael's pictures, may be claimed as the first of the "reproductive" engravers. In Germany an illustrious school of engravers flourished in the late 15th century, including in its ranks Martin Schongauer Albrecht Dürer Albrecht Altdorfer, the Behams, and Heinrich Aldegrever. Line engraving was somewhat later in beginning in France, but Jean Duvert (1485-1561) and Jean Cousin (1501-89) were famous, and the French portrait engravers of the 17th century touched heights that have hardly been equalled since. In Great Britain the great artists of the 18th and early 19th centuries owe much to British "reproductive" engravers, and William Blake's work in this medium was unique.

**Engrossing** (Fr. *en gros*, in large). Term used by English lawyers for the copying out, in a "fair hand," of any legal document. A lawyer always makes out a draft of any important document, and has it engrossed, and the engrossment is executed by the parties concerned.

**Engrossing.** Word used in former days in England for what amounts to buying and selling wholesale. In other words the engrosser was a middleman. This was early regarded as an offence against law and custom, for it tended to put up the price, and various statutes declared it illegal, the chief being one of 1552. These were directed mainly against the buying and selling of corn and other foodstuffs wholesale, and the operation of the laws tended to keep these in and around the places where they were grown. As society became more specialised this was irksome, and even when the laws were in full force licences were issued allowing certain persons to buy and sell wholesale. In 1663 an Act permitted engrossing as long as the price of corn did not exceed 48s. a quarter and in 1773 the earlier statutes against it were repealed. As an offence against the common law engrossing disappeared finally in 1844.

**Enham**, or KNIGHT'S ENHAM Village of Hampshire, England 2 m. N. of Andover. In 1919 the Enham estate of 1,027 acres was taken over by the Village Centres Council for the establishment of a centre for disabled ex-servicemen after the First Great War. Living accommodation and workshops were erected for training men in furniture and boot making, carpentry, tailoring, building, painting, agriculture, horticulture, and the care of livestock and poultry. The British Red Cross made a grant of £10,000 for a medical block for the treatment of physical disabilities, and the psycho-therapeutic treatment of neurasthenic and shell-shock cases.

In 1945 a sum of £250,000 subscribed by the people of Egypt in gratitude for the battle of Alamein was set aside for the extension of the village centre to accommodate men disabled in the Second Great War. The memorial, known as Alamein village, provided for the erection of 100 houses, a medical unit, hostels, and ancillary buildings. The settlement was re-named the Enham-Alamein Centre. Its offices are at 16, Grosvenor Place, London, S.W.1.

**Enharmonic** (Gr. *enarmonikos*, fitting in). In music, the interval between, for example, E natural and F flat, or C sharp and D flat. Through the influence of the keyboard instruments, with their fixed twelve notes to the octave, the term often loses this meaning and is defined as "a change of name without a change of pitch."



Enharmonic. Example of enharmonic change in music

**Enid.** City of Oklahoma, U.S.A., the co. seat of Garfield co. It is 65 m. by rly. N. of Oklahoma, and has an airport. The centre of an oil, gas, and grain producing region and of dairy and poultry farms, it has oil refineries, grain elevators, meat-packing plants, flour mills, and rly. shops. It makes drills, farm implements, wagons, lorries, glue, and gloves. The seat of Phillips university, it dates from 1893, when it was granted its city charter Pop. 28,081.

**Enigma Variations.** Popular name for the Variations on an Original Theme (Enigma) for full

orchestra composed by Elgar as his opus 36 and first performed under Richter at S. James's Hall, London, June 19, 1899. The work, frequently performed in whole or in part, owes its sub-title to Elgar's statement that there runs through it another theme that is not heard. A grave, slow theme is followed by 13 variations, each given a title indicating by initials or a nickname one of the composer's "friends pictured within." All have been identified, from no. 1, the composer's wife, to the finale, which runs straight on from No. 13, and represents Elgar himself. Sensitive treatment of solo instruments and an orchestral richness mark the whole work.

**Eniwetok.** Atoll in the Marshall Is. (*q.v.*). Fortified by the Japanese, Eniwetok was attacked by U.S. forces in 1944. Engebe, chief island in the atoll, was seized Feb. 18, Parry I. Feb. 22; 3,000 Japanese were killed in the fighting. In 1947 Eniwetok was made into a permanent testing ground for atomic weapons, its 145 inhabitants being transferred to another of the Marshall Is.

**Enlarger.** Photographic apparatus for making a print of a larger size than the negative. An image of an illuminated negative is projected by means of a lens upon a sheet of bromide paper. The illumination can be equalized by interposing a condenser between illuminant and negative, a diffusing screen of ground glass or opal, or a combination of condenser and screen. The negative image is thus focused upon an easel. Such apparatus is used in a dark room; enlarging boxes and cameras can be used in daylight, the bromide paper being carried in a loose dark slide.

**Enlistment.** Act of the individual in voluntarily contracting to render military service as a private soldier to the state. In Great Britain the form of contract is the attestation paper which the recruit, after being accepted and passed as medically fit, signs when taking the oath of allegiance, in the presence of an officer, magistrate, or other public dignitary, who witnesses or attests the signature. The period of service in the British army is laid down in the Army Act and recruiting regulations, and is normally 12 years, which may be spent wholly with the colours or part with the colours and part in the army reserve. Recruits may choose the branch of the service they prefer, and skilled men usually select one of the specialist corps. In the line the

recruit may choose any regiment for which he has a preference and which is open to recruiting. He cannot then, during peace time, be transferred to another regiment without his consent. In an emergency it may be necessary to seek powers by Act of Parliament for compulsory transfer of men from one corps to another to meet the exigencies of the service. A special branch of the army is detailed for recruiting duties, with an officer in charge of each district. Aliens and negroes may enlist in the British army, but cannot be promoted beyond the rank of warrant officer.

**Enna.** Ancient city of Sicily, the modern *Gastrogiovanni* (*q.v.*). It is first mentioned in history as having been taken by Dionysius I c. 397 B.C. It took part in the last Greek revolt against Rome and its people were massacred; in 134-132 B.C. it figured in the first great slave revolt as headquarters of the rebels. Originally Henna, it was known to the Romans as *Castrum Ennae*, corrupted in Arabic to *Kasr-Yani*, whence its modern name. It was a centre of Demeter-worship.

**Ennerdale.** Lake in the W. of Cumberland, England. From it Whitehaven draws its water supply; it is 3 m. long and  $\frac{1}{2}$  m. broad. In 1946 it was proposed to build a barrage at Ennerdale to raise the level of the lake by 5 ft. The project was opposed by the Friends of the Lake District and was temporarily suspended.

**Ennis.** Urban dist. and county town of co. Clare, Eire. It stands on the Fergus river, 25 m. N.W. of Limerick by rly. Here are the Roman Catholic pro-cathedral and college of the diocese of Killaloe, and the ruins of a Franciscan abbey. Ennis has a statue of O'Connell and in the neighbourhood are the ruins of Clare Abbey. Furniture and bootlaces are made, while milling is another industry. Market day, Sat. Pop. 5,868.

**Enniskillen** OR INNISKILLING. Market town and co. town of Fermanagh, N. Ireland. It stands on an island in the river between the upper and lower loughs Erne, and has suburbs on either side, with which it is connected by bridges. It has a rly. station

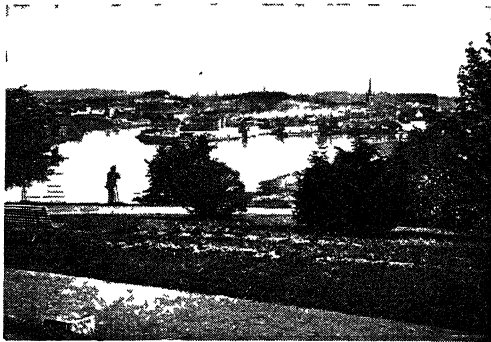
90 m. W.S.W. of Belfast. There are some small manufactures and a fair trade in agricultural produce. Enniskillen became a municipality

about 1600, and was represented in the Irish parliament. From 1800 to 1885 it sent one member to the parliament of the U.K. It is chiefly famous, however, as a Protestant stronghold in the time of William III, and as giving its name (in the form *Inniskilling*) to two regiments of the British army, fusiliers and dragoons. Market days, Tues. and Thurs. Pop. 6,030.

**Ennius.** QUINTUS (239-169 B.C.). Earliest of the great Roman poets. Born at Rudiae, in Calabria, he was not a full Roman citizen, acquiring that privilege at a later date. While serving in the Roman army in Sardinia, he attracted the notice of the elder Cato, who took him to Rome, where his knowledge of Greek and literary acquirements procured him admission to the Scipionic circle. His works embraced a wide variety of subjects, but it was as the author of some twenty tragedies and of the *Annales*, an epic of Roman history—in which, for the first time, the Latin language was moulded to the Greek hexameter—that Ennius achieved immortality. Only fragments of his works survive, chiefly in the form of quotations in later writers, especially Cicero. Some ancient critics regarded him as the equal even of Virgil, but his versification, though possessing a certain rugged dignity, is harsh compared with the finish which Latin poetry attained in the hands of Horace and Virgil.

**Enns.** Town and river of Austria. The town, which is 11 m. S.E. of Linz, stands just where the river falls into the Danube. An old place, it grew up around a castle built about 900. It became a free city, and was at one time a prosperous commercial place. Its chief buildings are the town hall, the castle, built in the 18th century, and a Gothic church. The river rises in the mountains near Radstadt and flows through Styria, passing through lovely mountainous scenery. Its course is east and then north. Its chief tributaries are the Salza and Steyer; its length is about 150 m.

**Enoch.** Name of four men in the O.T. They are a son of Cain, a grandson of Abraham, a son of

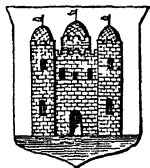


Enniskillen, Fermanagh, N. Ireland. View of the town and quays on the river connecting the upper and lower loughs Erne

Reuben, and a son of Jared. The last, the father of Methusaleh, is recorded to have lived 365 years, and to have been translated without dying. He is described as being the seventh from Adam, and the Epistle of Jude (verse 14) quotes a prophecy ascribed to him.

**Enoch, THE BOOK OF.** One of the non-canonical O.T. Apocrypha or Pseudepigrapha (*i.e.* works written under an assumed name), written originally partly in Aramaic and partly in Hebrew. It incorporates fragments of the Book of Noah. The work is not a unity in any sense, and ranges from about 200 B.C. to A.D. 64. It has therefore been described as a library rather than a single book. In the words of Dr. Charles (Religious Development Between the Old and the New Testaments), "it touches upon every subject that could have arisen in the ancient schools of the prophets." These subjects include the origin of evil, the millennium, the Messiah, the future life, and even the Hebrew calendar. The book seems to have had a considerable influence on N.T. theology. See Apocrypha.

**Enoch, BOOK OF THE SECRETS OF.** A book belonging to the same category as the Book of Enoch (*v.s.*). Dr. Charles describes this book as 2 Enoch and the Book of Enoch as 1 Enoch. The work, preserved only in Slavonic, seems to have been written by a Hellenistic Jew in Egypt at about the beginning of the Christian era. It is related in some way to a Hebrew book referred to in Jewish literature (in the Zohar) as "the Book of Enoch" and the "Book of the Secrets of Enoch." The writer is orthodox, but at the same time so broad-minded as to adopt into his philosophical system Platonic, Egyptian, and Zend elements. The book describes Enoch's ascension and voyage through the seven heavens.



Enniskillen arms

**Enoch Arden.** Narrative poem in blank verse by Tennyson, written in 1862 and published two years later. It tells of a seaman who travels abroad, is wrecked, and after years without communication comes home to learn that his wife has married again. There are beautiful descriptive passages, and a quiet emphasis, characteristic of the poet, on change and loss as elements in life.

**Ensa.** Popular name for Entertainments National Service Association, formed in 1939 by Basil



Ensa badge

Dean to provide entertainment for personnel of the British services. Ensa had its headquarters at the Theatre Royal, Drury Lane, London, and assumed responsibility for entertaining troops at home and overseas, being sponsored by the Navy, Army, and Air Force Institutes. Its activities included variety, concerts, drama, broadcasting, and cinema shows. On Nov. 12, 1939, the first concert was given to the B.E.F. in France, and up to June, 1940, over 5,500 entertainments were given in that country and attended by 2,242,559 persons.

In Great Britain each command was allotted about 20 parties giving 150 performances a week. From July, 1940, to Jan., 1942, audiences totalled 50,000,000. During 1942-43 Ensa parties were transported to and from 22,000 locations, travelling some 2,000,000 miles. They toured in North Africa, the Middle East, Italy, Iceland, and India. In 1944, 30,000 cinema shows and 12,000 stage performances drew nearly 20,000,000 people. The total expenditure of Ensa, excluding India and Burma, was almost £15,000,000.

India had its Ensa, although, owing to the long distances to be travelled, units were encouraged to provide their own entertainment. In Burma the first shows were given in March, 1944, on the Imphal sector; on the Chindwin performances were under an armed guard, lest a Japanese patrol should attack. By Jan., 1945, ten concert parties, five dramatic companies, and a pool of artists were operating in India, Ceylon, and Burma. Troops isolated in Waziristan, Persia, Iraq, and Tanganyika were visited by Ensa parties. In N.W. Europe, during the long, bitterly cold winter of 1944-45, Ensa sometimes

performed in lavishly equipped theatres in base areas, more often in half-demolished buildings close to the front line. Rediffusion vans, equipped with libraries of 500 records, visited troops in out-of-the-way localities.

At home Ensa artists provided entertainments for British and Allied forces and civilian war workers throughout the country until March, 1946. Ensa was succeeded by Combined Services Entertainment, which provided for every soldier a cinema show at least once a week and a live performance every five weeks; it was disbanded on Aug. 31, 1946, having provided some 2,500,000 performances for over 500,000,000 people.

**Enschede.** Town of Holland, in the prov. of Overijssel. It is 29 m. E.N.E. of Zutphen, and is a seat of the cotton-spinning and weaving industries. Enschede is a rly. junction. It was severely damaged by a conflagration in 1862. The British 11th armoured division liberated it from the Germans in the Second Great War, April 2, 1945. Pop. 90,289.

**Ensemble** (Lat. *in simul*, at the same time; Fr., together). In music, something which is considered as a whole, or with all the parts taken together, e.g. the united performance of all voices or instruments engaged in rendering a piece of concerted music, like a quartet or quintet; the united performance of an orchestra or chorus; the total effect of such performance. By extension the term is applied to a theatrical performance, including scenery, costumes, etc.

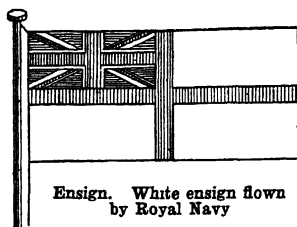
**Ensign.** Flag which a ship carries astern to indicate her nationality. Each country has separate

earliest date on which the S. George's cross, the forerunner of the white ensign, was flown by English admirals was in the Cadiz expedition of 1596. The Royal Air Force ensign consists of a sky-blue ground with the union flag in the jack and the R.A.F. red, white, and blue roundel in the fly. The civilian ensign is also of sky-blue ground with the union flag in the jack; it carries in addition a dark blue cross edged with white. War department vessels fly a blue ensign with crossed swords in the fly. When a ship flies her ensign upside down it denotes that she is in distress. *Pron.* Ens'n. *See* Flag.

**Ensign.** Rank in the British army, now obsolete. It was given to an officer of the infantry on first being commissioned, and it was his duty to carry and guard the regimental colours, both on parade and in the field. The corresponding rank in the cavalry was cornet, and both were discarded in 1871 when the purchase of commissions was abolished, the rank of second-lieutenant being substituted. Ensign is a rank in the United States navy held by the lowest grade of officer and equivalent to midshipman in the Royal Navy. *Pron.* En'-sine.

**Ensilage.** Food for farm livestock produced by preserving fodder crops in a green, succulent condition for use at a later date. When the cost of labour in the production of root crops was low, the practice of ensiling fodder material did not receive much attention in Great Britain; now with greatly increased labour costs the practice is general. Crops best suited for ensiling are mixtures of oats and tares, oats and peas on light land, and oats, beans, and tares on heavy land. Tares and peas require a plant such as oats to support them and prevent their becoming fouled with soil in wet weather. But any green, succulent vegetable material can be ensiled; and in weather unfavourable for hay-making, grass is frequently used. In the U.S.A. green maize, sorghum, and sunflowers are commonly grown for ensilage.

The three methods by which ensilage is made are siloing, clamping, and stacking. The silo is a building of timber, concrete, etc., frequently taking the form of a tower 30 or more feet high. The silage crop is gathered in a green condition, cut into small lengths, blown into the top of the silo, and distributed and consolidated by hand. Silos of



Ensign. White ensign flown by Royal Navy

ensigns for its navy and its mercantile marine. Great Britain has three, allocated since 1864 as follows: the white ensign is flown only by ships of the Royal Navy and vessels of the Royal Yacht Squadron; the blue ensign is the flag of the Royal Naval Reserve; and the red ensign is the flag of the merchant service. The

this description involve substantial capital outlay but are free from the waste occurring in clamping or stacking. Clamping consists of dumping the green crop straight from the field into an excavated space 1-3 ft. deep. Consolidation is provided by the filled carts which are drawn over the top of the clamp as it is formed. Earth is then piled against the sides and on top of the heap to maintain compactness and exclude the air. Silage stacks, built at any convenient position in a field, are formed of the green crop carted straight from the field after cutting.

The material resulting from the three methods of preparation is described as "sweet" or "sour." Sweet silage has a pleasant smell like that of slightly heated hay; it is usually dry, light brown in colour, and gives rise to lactic acid; livestock eat it readily. Sour silage is much darker in colour and possesses an unpleasant odour due mainly to butyric acid. The differences in the two forms arise from the method of making: sweet silage is produced in the presence of a liberal supply of air, and in the early stages the temperature rises to as much as 50° C.; but in sour silage the amount of air circulating in the heap is limited, and the chemical changes involved are in part putrefactive and brought about largely at the expense of protein.

**Ensor, JAMES, BARON** (1860-1949). Belgian painter. The son of an English father and a Flemish mother, he was born April 13, 1860, at Ostend, where, except for three years at the Brussels academy, 1877-1880, he spent his life. In 1930 he adopted Belgian nationality, and was created a baron. When Belgian art was foundering in a realism that was by turns affected, sentimental, and vulgar, Ensor's work had a great influence not only in his adopted country, but upon all European art. Recognition, however, was slow, and not until 1929 was Ensor's reputation established with a retrospective exhibition in Brussels. The element of fantasy which distinguished much of his subject matter was at its best in such works as *Skeletons Warming Themselves*, and *The Battle of the Golden Spurs*. Exhibitions of his work were held at the Leicester Galleries, 1936, and the National Gallery, 1946. He died Nov. 19, 1949.

**Ensor, ROBERT CHARLES KIRKWOOD** (b. 1877). British historian. Born Oct. 16, 1877, he was educated at Winchester and

Balliol College, Oxford, and was called to the bar in 1905. A leader writer on the *Manchester Guardian*, 1902-04, and the *Daily News*, 1909-11, he was chief leader writer on the *Daily Chronicle*, 1912-30. Deputy for the Gladstone professor of political theory and institutions at Oxford, 1933 and 1940-44, he became a research lecturer at All Souls. His *Modern Socialism* appeared in 1903, and his best known books include *Columbus*, 1925; *Courts and Judges*, 1933; *England, 1870-1914*, 1936; *A Miniature History of the War*, 1945.

**Enstatite**. A common rock-forming mineral. One of the pyroxene group, it crystallises in the orthorhombic system, in stout prismatic crystals. Chemically essentially a metasilicate of magnesium, it occurs in the intermediate and basic igneous rocks, low in lime content, also in derived serpentines and, less commonly, in metamorphic rocks. It is often found in parallel growth with a monoclinic pyroxene. It is a common constituent of metallic and stony meteorites.

**Entablature**. Term in architecture signifying the combination of architrave, frieze, and cornice at the summit of a building. In early Greek architecture the entablature, like the supporting column, was frequently of wood; and there is evidence to show that it was constructed of this material for some time after wooden columns had been replaced by stone or marble. In the Greek towns of S. Italy wooden entablatures upon stone columns are known to have been in use for several centuries. The entablature is necessarily a prominent feature of the classic or horizontal styles of architecture, rather than of the Gothic or vertical styles; but its principle is universal. The original meaning of the word was a board work or flooring (Lat. *tabula*, plank). See *Architecture*; *Cornice*.

**Entail**. The settling of an estate on a man and the heirs of his body. In feudal times land was granted to a man and his heirs in tail male or tail general, the idea being that if an heir failed it would revert to the king or lord who granted it. In time, however, the practice grew up of regarding it as a free estate as soon as an heir was born, thus depriving the grantor of his rights. The statute *De Donis Conditionalibus* of Edward I put an end to this practice, but only for a time, as legal fictions for evading it were in-

vented. The entailed estates of today are simply settled estates, but they can be settled only on living persons and a period of 21 years beyond. In 1926 entails ceased to be legal estates and are now equitable interests, more properly called entailed interests. They are still part of the system of settlement under which large landed estates are held. See *Land Laws*; *Real Property*; *Settlement*.

**Entamoeba**. Any member of a group of protozoa parasitic within some host, usually in the gut. Various species cause disease, e.g. amoebic dysentery.

**Entebbe**. Administrative capital of the Uganda protectorate, E. Africa. It is situated on a promontory to the W. of Murchison Bay in Lake Victoria, and is connected with Kisumu and other lake harbours by steamer. Mengo, the capital of Buganda, is 25 m to the N.E.

**Entente Cordiale** (Fr., cordial understanding). Phrase that became current early in the 20th century to signify the friendly relations then beginning to exist between Great Britain and France. The entente began soon after the South African War and was greatly helped by the influence of Edward VII and the growing realization of the German menace. It led to the alliance of 1914.

**Enteric Fever** (Gr. *enterikos*, intestinal). Infective disease caused by the bacillus typhosus. It is commonly contracted by drinking infected water or milk. See *Typhoid Fever*.

**Enteritis** (Gr. *enteron*, intestine). Inflammation of the mucous membrane of the intestine. The condition may be due to eating unsuitable or unsound food, such as unripe fruit or decomposing meat, or to irritant poisoning by arsenic, mercury, and other substances. Secondary enteritis is a symptom of many diseases, particularly cholera, dysentery, and typhoid fever.

The prominent characteristics are abdominal pain, severe diarrhoea, and sometimes blood in the evacuations. In severe cases ulceration of the intestine may be followed by perforation and fatal peritonitis. Epidemic enteritis, or "summer diarrhoea," can be a fatal disease among infants under one year of age, in large towns sometimes accounting for one-fifth of the total infant mortality. The disease is most prevalent in hot, dry weather, the dust blown up from dirty streets and refuse heaps being an important causative

factor. Treatment should deal with the essential cause and with the diarrhoea.

**Enteroptosis** (Gr. *enteron*, intestine; *ptosis*, falling). General downward displacement of the abdominal organs, in particular the stomach and intestines. The condition develops gradually, and is more frequent in women than in men, encouraged possibly by the stretching of childbirth or by the greater width of woman between the pelvic bones. Enteroptosis is often found in association with neurasthenia; a highly strung nervous system is more aware of the discomfort caused by the pull of the displaced organs, and, conversely, the displaced organs exercise a malign influence on the system. Massage, electricity, and physical exercises improve the tone of the slack abdominal muscles, and distress is often relieved by the wearing of a belt so designed as to support the sagging structures.

**Enterprise.** British steamship, the first to make the passage between Great Britain and India. She left London Aug. 16, 1825, and reached Calcutta Dec. 7. The *Enterprise*, which displaced 480 tons and had engines of 120 h.p., was also the first steamship to double the Cape.

**Entertainments Duty.** Tax levied in the U.K. on charges for admittance to entertainments, i.e. any exhibition, performance, amusement, game, or sport; first introduced as a war measure in the budget of 1916, and since retained with modifications. Duty is payable even if the person making the charge is not connected with the entertainment, as where persons pay to see a procession from a window. There are many exemptions; the most important are: (1) Entertainments where the gross takings are devoted to philanthropic or charitable purposes. If the expenses do not exceed 50 p.c. of the takings, duty is payable in the first place but will be refunded. (2) Entertainments which are wholly educational. (3) School and similar entertainments by past or present pupils if the school is not conducted for profit. (4) Certain industrial, artistic, or public health exhibitions.

The rate of duty varies with the price of admittance, and is altered from time to time in the budget. No duty is payable on payments of 3d. or less. Mainly to assist theatres a reduced rate was introduced in 1935 and

extended in 1946 for certain entertainments where all the performers are actually present—e.g. stage plays, ballets, concerts, lectures, recitations, music hall and variety entertainments, circuses, and travelling shows, menageries, or any game or sport except the racing of animals, vehicles (other than pedal cycles), motor vessels, and aircraft. At some entertainments no duty is chargeable at all since the Finance Act, 1946, if the entertainment is provided by an organization not conducted for profit and whose activities are partly educational.

**Enticement.** Term in law. Anyone who induces a wife to leave her husband so that he loses her "comfort and society" may be sued by the husband for damages for enticement. In 1923 it was decided that a wife has a similar remedy against anyone who induces her husband to leave her. It is not necessary that the wife or husband should have committed adultery with the enticer.

**Entombment.** Literally a burial. In a special sense, however, it is applied to the burial of Jesus Christ, and as such is the subject of several notable paintings. The most famous of these are one by Raphael, in the Borghese Palace at Rome, one by Titian in the Louvre, and one by Caravaggio, in the Vatican.

**Entomology** (Gr. *entomon*, insect; *logos*, science). Branch of zoology which deals with insects. The offices of the Royal Entomological Society of London are at 41, Queen's Gate, S.W.7. The Imperial Institute of Entomology is housed at the Natural History Museum, London, S.W.7. See Insects.

**Entomostraca** (Gr. *entomon*, insect; *ostrakon*, shell). One of the divisions into which crustacea (*q.v.*) are divided. It includes the lower forms of crustaceans.

**Entozoa** (Gr. *entos*, within; *zōon*, animal). The name given to parasitical forms which live in the interior of the body of their host. Examples are the tape worm and flukes. They are opposed, therefore, to the ectozoa, which live on the exterior. See Parasite.

**Entr'acte** (Fr. *entre*, between; *acte*, act). Short piece of music played by the orchestra between the acts or scenes of a play. It is generally of a suave and melodious character. Sometimes, in a musical play, it consists of the development of a melody or *leitmotiv* embodied in the work; sometimes of an independent piece.

**Entrecasteaux, JOSEPH ANTOINE BRUNO D'** (1739-93). French sailor. A native of Provence, he entered the navy. He commanded a ship in the war against Britain, but his great work was as a discoverer. As commander of the French fleet in the E. Indies, he visited China; he was also governor of Mauritius and the Île de Bourbon. He sailed into the South Seas and made several discoveries therein, a strait, a point, and a group of islands commemorating his name (see D'Entrecasteaux). He was in the East when he died, July 20, 1793.

**Entre Minho e Douro.** Prov. of N.W. Portugal. It lies between the Minho and Douro rivers, facing the Atlantic. Mountainous and well watered, it has a mild climate, and produces maize, wine, oil, fruit, and nuts, while palms and fuchsias thrive. Cattle and pigs are reared, timber is cut on the mts., and fish abound in the rivers. Though implements are primitive, agriculture flourishes. The roads are bad; ox-traction is the chief form of transport. The Oporto-Corunna rly. runs near the coast. Oporto is the chief port. This most densely populated prov. is divided into the three districts of Vianna do Castelo, Braga, and Porto Area, 2,790 sq. m. Pop. 1,679,798.

**Entrenchment.** Military term for an excavated position protecting troops in attack or defence. Entrenchments became necessary with the development of firearms, and were first used on a large scale by the Turks in the 15th century. The fire-power of machine-guns and the use of shrapnel and high explosive, combined with the vulnerability of infantry, necessitated large-scale development of entrenched warfare during the First Great War. It continued until the introduction of tanks. The mobile armoured operations of the Second Great War rendered permanent entrenchments obsolete, and such forms of defence were restricted to slit trenches and fox-holes for the temporary protection of advancing infantry held up by air or artillery attack.

**Entrepreneur** (Fr. *entre*, between; *prendre*, to take). Word used for one who brings capital and labour together. Employing them as he thinks best, he pays interest to the one and wages to the other, keeping any balance of profit for himself. The old theory of economics that the partners in industry were the



landowner, the capitalist, and the labourer left out of account the fact that in large undertakings the directing brain often belonged to none of these classes. He was simply one who hired the others, and the word *entrepreneur* was invented to describe him.

**Entre Rios** (Span., between rivers). Prov. of N.E. Argentina, occupying the angle between the Paraná and Uruguay rivers. The surface is low, alternating between swamps and prairies, while in the N. it is heavily forested and furnishes wood for building and cabinet-making. Cattle, sheep, and horses are raised by the million, and, together with hides, horns, and other animal products, are exported. Cereals, wine, and alfalfa are grown. The prov. has a healthy climate, and, traversed by several rlys. and waterways, it is one of the most prosperous in the republic. The capital is Paraná. Area, 30,243 sq. m. Pop. 564,198.

**Entre Rios.** Town of Brazil, in the state of Rio de Janeiro. It is about 50 m. by rly. N. of Rio de Janeiro, in a coffee-producing district. There is another Brazilian town of this name in the state of Goyaz, 45 m. N.W. of San José.

**Entropy** (Gr. *entropē*, turning in). An important concept in the theory of heat engines and the science of thermodynamics. The entropy of a substance is a quantity which increases with any increase in the total heat of the substance and likewise decreases with any decrease in the total heat. The change of entropy is measured by the change in the quantity of heat divided by the absolute temperature at which this change takes place. Thus the entropy of a system under what are known as adiabatic conditions, where heat neither enters nor leaves the system, is constant.

Where heat simply flows from a hot body to a cold one, the loss of entropy by the hot body is more than made up by the gain of entropy by the cold body, so that there is a net gain of entropy on the whole. In a heat engine, heat flows from a hot body to a cold one, but in the process some of the heat disappears, being converted into work. With a theoretical engine of maximum efficiency, there would be no change of entropy due to this process, but no actual engine succeeds in converting as much of the heat into work as the theoretically perfect engine, and the effect of an actual heat engine is a net gain of entropy.

As heat is everywhere flowing from hot bodies to cold ones, the entropy of the universe as a whole is continually increasing, and is often said to be tending towards a maximum. In such an imaginary condition of maximum entropy there would be no motion, all the existent energy of the universe would be converted into heat, and the whole would stagnate at a uniform temperature. In the earth's atmosphere entropy increases slightly from the surface until the base of the stratosphere is reached; thence entropy increases rapidly with height. Meteorologically the condition of any level of the atmosphere at a given time is defined by a statement of its entropy, its temperature, and its water vapour content. See Carnot's Cycle; Energy; Thermodynamics.

**Enuresis** (Gr. *en*, in; *ourein*, to urinate). Involuntary discharge of the urine. It is commonly seen in young children who have not acquired full control over the bladder. If it occurs at night, it is known as nocturia. It may be due to irritation of the bladder walls by acid urine or by a polypus, or to the presence of worms in the rectum. The condition is associated with some forms of paralysis. If a case persists, threats of punishment may do much harm, as the underlying cause may be a psychological maladjustment needing skilled treatment.

**Envelope.** Gas bag of an airship, or, in a rigid airship, the whole body of the vessel within which the gas bags are housed. Gas bags are made of skin or fabric, and the outer envelope of the rigid airship is a stouter fabric, rubberised or otherwise treated so as to resist absorption of moisture and the effects of weather. See Airship.

**Enver Pasha** (c. 1882–1922). Turkish soldier and politician. Born at Apana, on the Black Sea, of humble parentage, he entered the Turkish army in 1896. He first came into notice in connexion with the Young Turk movement in 1905 at Salonica, and later joined the revolutionaries who, in July, 1908, captured Monastir, where a constitution, accepted by the sultan Abdul Hamid, was proclaimed. Enver soon afterwards was appointed military attaché at Berlin, but on the outbreak of the Turkish counter-revolution in March, 1909, he returned to Salonica, and assisted in the deposition of Abdul Hamid.

Enver then went back to Berlin, and in 1910 paid a visit to

London. In 1911 he organized the Arabs of Tripoli against the Italians in the Tripoli War.



Enver Pasha,  
Turkish soldier

In the second Balkan War he recaptured Adrianople from the Bulgarians in July, 1913. Shortly before, he had become minister of war with the rank of pasha, and married one of the imperial princesses. One of the leading spirits of the Committee of Union and Progress, the central organization of the Young Turks, he was personally pro-German, his influence being one of the factors that brought Turkey into the First Great War against the Entente. After the submission of Turkey in 1918 Enver fled to the Caucasus. He encouraged the Turks in their resistance to the terms of the peace treaty in 1920. He was killed in Bukhara, Aug. 4, 1922.

**Environment** (Fr. *environ*, around). Biological term for the sum total of all the conditions, agencies, and influences which affect the development, growth, life, and death of an organism, species, or race. Various theories of evolution have maintained, on the one hand, that variations in animals and plants arise fortuitously, and may fit the organism for life in particular environments; on the other hand, that environment itself produces modification in the living organism. In the absence of adaptation to environment, no organism could live and reproduce itself, and the ultimate object of a living creature must be reproduction. The term is usually understood to refer to physical, chemical, or material agencies. With reference to highly evolved animals it includes, in its widest sense, mental influences, so that it may be said that each individual lives in an environment consisting of physical, mental, and, for man, spiritual parts. In education and psychology, the perennial argument whether heredity or environment (nature or nurture) plays the more important part in an individual's mental development remains unresolved, most eugenicists claiming the former and many educationists the latter as the more potent influence. See Ecology; Eugenics; Evolution; Heredity.

**Envoy** (Fr. *envoyer*, to send). Term used for one sent to a diplomatic errand. It is more general

than ambassador, being used for persons who go on temporary missions to foreign courts as well as for more permanent officials. The former are described as envoys; the latter are envoys extraordinary, and include ambassadors. See Diplomacy.

**Enzyme** (Gr. *en*, in; *zymē*, leaven). A complex organic substance formed by living cells. Often described as biochemical catalysts, enzymes are classified according to their properties, their chemistry not being fully understood. They exist in the colloidal state, and may be rapidly inactivated when heated in the presence of moisture.

Enzymes play a part in industrial processes such as brewing, baking, and cheese making, and as laboratory agents in pharmacy. The most familiar example of their action is the fermentation of sugar by yeast, a minute unicellular organism. Yeast cells contain an enzyme which converts sugar into alcohol and carbonic acid gas. Enzymes help, too, in the digestion of food. Ptyalin, secreted by the salivary cells, converts cooked starch into dextrin and maltose; pepsin, secreted by cells in the stomach, changes protein to proteoses and peptones; and enzymes in the pancreatic juice convert fat into simpler bodies. The souring of milk and the decomposition of meat by bacteria are other instances of enzymic change.

It is suggested that consciousness in some way depends on enzyme action in the brain cells; that unconsciousness resulting from an anaesthetic depends upon a cessation of their enzyme life. Enzymes are vitally necessary to every chemical process involved in respiration. The action of many poisons and anaesthetics depends on paralysis of the respiratory exchange of a specific group of cells. See Fermentation.

**Eoanthropus** (Gr. *ēos*, dawn; *anthrōpos*, man). Systematic name of the oldest known European race with distinct head traits. It was given by A. S. Woodward to some fossil bones now in the British Museum, unearthed in 1912 at Piltown, Sussex. After their discoverer, Charles Dawson, the species is called *E. Dawsoni*. Other remains were subsequently found. See Man; Piltown Skull.

**Eocene** (Gr. *ēos*, dawn; *kainos*, recent). Name given to the earliest part of the Tertiary period, when stratified rocks, the eocene system, were being formed. It followed the

Cretaceous period, the strata of both ages merging gradually in S. Europe, America, and New Zealand. In W. Europe, at the end of the Cretaceous period, great geographical changes were in progress; consequently there is a sharp line of demarcation between the two sets of strata. Eocene beds usually rest on eroded surface of chalk. Eocene rocks of W. Europe are usually soft sands and clays, with some limestone and marl; all were laid down in local basins under marine, brackish, or fresh-water conditions. In S. Europe, Caucasus, Asia Minor, N. Africa, through Persia towards China and Japan, great thickness (several thousand feet) of limestone developed, made up in places largely of the fossilised shells of large disk-shaped foraminifera (nummulites). Volcanoes were active in eocene times, old lavas and other forms of rock being found in Antrim, Inner Hebrides, Apennines, Western U.S.A., etc.

The forerunners of nearly all kinds of animals now living appeared in eocene times. The early ancestors of the horse had then five toes; small, pig-like, marsh-dwelling animals in Africa represented the original stock from which elephants came. Placental mammals appeared in great numbers. Crocodiles and toothed birds lived in a sub-tropical estuary where London now stands. Important areas of eocene deposits are known as London, Hampshire, and Paris basins. Various beds in the London basin, in order of succession, are Thanet Sands (at base), Woolwich and Reading Beds, Blackheath Pebble Bed, London Clay, Bagshot Sands; total thickness about 970 ft. Those of the Hampshire basin are much thicker, and slightly different; no Thanet Sands at base, great development of Barton Beds at top, and Brocklesham and Bournemouth Beds in the middle.

**Eolian Deposits.** This term in mineralogy is also spelt Aeolian and is so listed in this work.

**Eolis.** Small nudibranch mollusc. It has no shell and no true tentacles. It has secondary gills and is marine.

**Eolith** (Gr. *ēos*, dawn; *lithos*, stone). Stone implement of ruder workmanship than those of the Palaeolithic age, so called in 1892 by J. Allen Brown. Theoretically the Chellian hand-axe had a long antecedent history, back to the time when primeval man, or even his anthropoid precursors, first employed unwrought stones as tools. Many such flints have been

found, notably at Ightham, Kent, and in the Ipswich Red Crag, for which human use is claimed. A characteristic hawk-beak form (rostracarinata) is regarded by Ray Lankester as ancestral to true palaeoliths. The colithic stage of industry was traceable in modern savagery among the aboriginal inhabitants of Tasmania.

**Eon de Beaumont**, CHARLES GENEVIÈVE LOUISE D' (1728-1810). French diplomat. Born



Eon de Beaumont, French diplomat

in Burgundy, Oct. 5, 1728, he entered the army in 1755, and in 1757, having attracted the attention of Louis XV, was sent, disguised as a woman, on a diplomatic mission to Russia.

In 1762 he came to England, where in a fit of pique he published certain libels for which he was convicted in 1764 and outlawed. The question of his sex had aroused such controversy that heavy bets were made and gambling policies of assurance effected. General opinion declared him a woman, and Eon took no steps to decide the matter. He returned in 1777 to France, where he lived as a woman, but came back to England in 1785, and ten years later, having lost everything in the French Revolution, dressed as a woman he gave an exhibition of fencing in London, where he died, May 21, 1810. A post-mortem examination showed masculine characteristics.

**Eos.** In Greek mythology, goddess of the morning. She is identified with the Latin Aurora (*q.v.*).

**Eosin.** Scarlet-coloured aniline dye prepared by the action of bromine upon fluorescein. It occurs as dark brown crystals with a green metallic lustre, different strengths and shades of colour being distinguished commercially by the addition of letters, *e.g.* A, GGF, DH. It is used to make red ink, as a dye for fabrics, paper, and cosmetics, and as a stain in microscopy. See Dyes.

**Eöthen** (Gr., from the East). Travel book by A. W. Kinglake, first published in 1844 with the full title of Eöthen; or Travels Brought Home from the East. A most engaging book, it describes the author's journeyings from Belgrade to Constantinople and Cairo, and through Palestine.

**Eötvös, JOZSEF, BARON** (1813–71). Hungarian novelist and statesman. He was born Sept. 3, 1813, at Buda, and educated at the university there. After travelling extensively in Western Europe, he returned to Hungary, and in 1838 produced his novel *The Carthusian*, a sentimental study of a wealthy young French count who retires from the world and becomes a monk. His second novel, *The Village Notary*, 1846, is an attack upon serfdom and other evils. His Hungary in 1514, an historical romance describing the great peasant rising under Dozsa, and the terrible vengeance taken by the nobles, appeared in 1847. The Influence of the Leading Ideas of the Nineteenth Century upon the State (1850–54) is an attempt to show how far it is possible fully to realize the doctrines of liberty, fraternity, and equality. Eötvös was twice minister of public instruction, in the first Hungarian ministry of 1848 and in the Andrássy ministry of 1867, and set up a system of national education. He died Feb. 2, 1871.

**Eozoon** (Gr. *ēōs*, dawn; *zōon*, animal). Name given to mineral structure, consisting of thin wavy layers of white calcite and green silicate (serpentine), curiously intergrown, and resembling structures of certain lowly organisms. Found in the pre-Cambrian rocks in Canada, it was formerly regarded as of organic origin.

**Epacris** (Gr. *epi*, on; *akris*, top). Genus of shrubs of the family Epacridaceae. Natives of Australasia, they have scattered leaves and abundant, cylindrical, bell-shaped flowers produced singly from the axil of a leaf. They are largely grown in European greenhouses, and many varieties and hybrids have been produced. A few species have edible berries.



*Epacris nivalis*, a greenhouse plant from Australia

**Epact** (Gr. *epaktos*, brought on, added). Number of days in the moon's age on Jan. 1. The excess of the solar year over the lunar is about 11 days. Should a new moon fall on Jan. 1, the epact of the ensuing year would be zero or 0. On Jan. 1 of the calendar year following the epact would be 11. The number is increased accordingly until, at the end of the lunar cycle, 19 years, the moon's aspects begin to be repeated. As the

moon's age cannot exceed 30 days, the epacts 0, 11, 22, are followed by 3. The epact was formerly used in calculating the date of Easter. See Calendar; Chronology; Lunar Cycle; Solar Cycle.

**Epaminondas** (c. 418–362 B.C.). Theban general and statesman. Although of aristocratic family, his early life was spent in poverty. He first came forward as a man of outstanding ability at the battle of Leuctra (371), when he was chiefly responsible for the great defeat inflicted on the Spartans which brought to an end the Spartan hegemony over Greece. Epaminondas determined to follow up his victory and to break the power of Sparta in Peloponnesus, her particular stronghold. With this object, he united the cities of Arcadia in a league, with the new city of Megalopolis, founded by himself, as the capital. As part of the same policy, Messenia, which had been for three centuries under the heel of Sparta, was made into an independent state. Dissension, however, arose in the new Arcadian league, some of its members inclining towards Sparta. In 362 the Spartans sent an army into Arcadia, which was defeated at the battle of Mantinea, but Epaminondas fell in the battle. During his lifetime, Epaminondas had raised Thebes to be the leading power of Greece, but its hegemony did not last after his death.

**Epaulette** (Fr., little shoulder). Fringed shoulder piece worn on full dress uniform by officers of the Royal Navy and on the great-coats of Royal Air Force officers and bearing the markings indicating rank. British naval epaulettes are of gold bullion with a fringe, and R.A.F. epaulettes are of cloth. Epaulettes were formerly worn by all ranks of the British army, but in 1855 they were abolished except for general officers' full dress uniform and for tropical uniform. They are worn by all ranks in certain foreign armies. The epaulette is a survival of the epaulière or metal shoulder-plate of medieval armour.

**Épée** (Fr., sword). French duelling and fencing sword. It weighs 1½ lb. and has a triangular blade 35 ins. long. It has no cutting edge and is used for thrusting only. The grip is 8 ins. long and is protected by a circular guard or shell. The

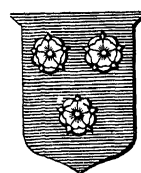
épée was first used in English fencing in 1900. It has given its name to a thrust or point in that sport. See Fencing.

**Épéhy**. Small town of France, in the dept. of Somme, 13 m. S.E. of Cambrai, with a station on the rly. from Calais to Paris. It figured prominently in the campaigns of the First Great War, being captured from the Germans by the British, April 1, 1917, and becoming the scene of heavy fighting in the German counter-attack after the battle of Cambrai, Nov., 1917. Retaken by the Germans early in their great final offensive of March, 1918, it fell to the British in Sept., 1918, in the so-called battle of Épéhy.

The Hindenburg Line lay little more than a mile to the E., and it was during the final Allied advance to that line that the battle developed. After initial operations to N. and S., the main attack, covered by a creeping barrage, was launched on Sept. 18 in heavy rain, by British troops of the 3rd and 4th armies, the Australian corps, and a corps of the 1st French army, on a front of over 25 m. By Sept. 25, after continuous heavy fighting and many casualties, all ground and positions needed for the Allied attack on the Hindenburg Line had been secured. The Australians had particularly distinguished themselves, breaking through an extent of 5,000 yds. of German front on the first day, and establishing themselves in the outer defences of the Hindenburg Line. German prisoners in the British section of the front numbered 11,750, and 100 guns were captured. In all, 14 British divisions opposed 15 German. The British success was the more notable in that the troops had been fighting almost continuously for seven weeks, suffering 72,000 casualties in that time.

**Épernay**. Town of France, in the dept. of Marne, about 19 m. W.N.W. of Châlons-sur-Marne.

Important industries include spinning, tanning, cork and cask making, and brewing, but above all the champagne industry, the wine being stored in cellars hollowed out of the chalk rock. In normal times about five million bottles are laid down annually. The town was occupied by the Germans early in the First Great War, and was one of the German objectives in the



Épernay arms

second battle of the Marne, July, 1918, when the assistance of the British divisions, Yorkshiremen and Highlanders, in the defence of Épernay, was specially recognized by Gen. Berthelot. Pop. 19,703. See Marne, Battles of the.

**Ephah.** In the O.T., name for the first in order of the sons of Midian (Gen. 25; 1 Chron. 1; Isaiah 60); concubine of Caleb in the line of Judah (1 Chron. 2); son of Jahdai (1 Chron. 2). The word, of Egyptian origin, was adopted as the name of a Hebrew dry measure which corresponded to the *bath* in liquid measure.

**Ephedra.** Genus of herbs. Under the name Ma Huang (astringent yellow), species of *Caleba* herb have been used as a medicine in China since ancient times. The genus belongs to the joint-fir family of gymnosperms, distinct species being distributed in the temperate and subtropical latitudes of Europe, Asia, and America, growing especially well in N. China, N. India, and Spain. The plants are mostly low, much branched, often procumbent, occasionally climbing shrubs, the green stems being collected for medicinal use. The chief constituents of *ephedra* are the alkaloids *ephedrine* and *pseudoephedrine*.

**Ephedrine.** Alkaloidal active principle ( $C_{10}H_{15}ON$ ) present in various species of *ephedra*. A synthetic preparation was evolved in 1927. It has a physiological action resembling that of *adrenalin* (*q.v.*), to which it is closely related chemically. Although isolated in pure form by the Japanese chemist Nagai in 1887, not until 1923, through the work of Chen and Schmidt, was the possible value of *ephedrine* as a therapeutic agent recognized and the substance made available for general use in the therapy of allergic diseases. *Ephedrine* has a more prolonged action than *adrenalin* and has the great advantage of being effective when given by mouth.

**Ephemera** OR MAY FLY (Order Ephemeroptera: Gr. *ephermos*, living a day; *pteron*, a wing). Insect with long slender abdomen, ending usually in three long bristle-like cerci. The eyes are large, antennae short, and the wings membranous and net-veined. The mouth-parts are aborted, no food being taken in the adult stage. The nymphs are all aquatic, breathing by lateral gills. The perfect insects are common about May; many kinds live but a few hours, and others survive days in favourable weather. About 40 species are

British. Fish rise readily to seize certain species, and at the time of the May fly anglers expect to secure exceptional catches by the use of fisherman's flies made in imitation of the natural creature.

**Ephemerides** (Gr. journals). Astronomical tables showing the predicted positions of a heavenly body for every day during a given period. When the elements of a planet's or comet's orbit are known an *ephemeris* can be calculated for its future position. Accurate *ephemerides* for the sun, moon, and planets are published in advance in the *Nautical Almanac*.

**Ephesians**, EPISTLE TO THE. The first of the group of Pauline epistles commonly known as the Epistles of the Captivity, because they seem to have been written probably between A.D. 61 and 63, during S. Paul's first imprisonment in Rome. It was probably intended to be a circular letter, and was not addressed particularly to the Ephesians. It contains no personal greetings to the friends of the apostle, and in the two best Greek MSS the words "in Ephesus" ("to the saints which are in Ephesus") are omitted. Moreover, Marcion speaks of it as the Epistle to the Laodiceans.

Its connexion with the Epistle to the Colossians is so close that the one is sometimes supposed to be an expansion of the other, but such a supposition is unnecessary. The external evidence for the authenticity of the epistle is sufficient, if not conclusive. As regards internal evidence, the fact that the language and thought differ somewhat from those of other Pauline epistles has caused difficulties, but these are by no means insuperable. The circumstances that impel a writer to take

up the pen, the mood in which he writes, are not always the same, and, in the interval between the writing of one epistle and another, the language and thought of S. Paul may have undergone considerable development as a result of his experiences.

**Ephesus.** Ancient city of Asia Minor, situated on the Cayster (Gr. *Kä-ystros*), near its mouth. It was the chief of the twelve Ionian colonies of Asia, and was founded probably about 1000 B.C. In the 6th century it fell, with the other Greek cities of Asia Minor, under the dominion of Croesus, king of Lydia, and later under that of Cyrus the Great, king of Persia. During the Athenian hegemony it paid tribute to Athens, but about the beginning of the 4th century B.C. it again passed under Persian rule. When Persia was overthrown by Alexander the Great, it acknowledged the Macedonian supremacy, and eventually, after the Roman conquest of Greece, became the administrative capital of the Roman province of Asia. Its fall was mainly owing to the silting of its harbours by the Cayster.

Ephesus was noted for the worship of Artemis or Diana; its temple to the goddess was regarded as one of the seven wonders of the ancient world. The city was visited by S. Paul on his second and third journeys, and was an early seat of Christianity. Ephesus was the birthplace of the philosopher Heraclitus. There are ruins of a theatre (Acts 19, 27), a stadium or racecourse, an odeum or hall in which musical and poetical contests took place, and the temple of Artemis. Consult Discoveries at Ephesus, J. T. Wood, 1877; Excavations at Ephesus, D. G. Hogarth, 1908.



Ephesus. Excavated ruins, looking towards the sea: in the foreground, ancient main street; in the distance, the prison of S. Paul, on the hill top

**Ephesus, COUNCILS OF.** Six important councils of the Church held between the 2nd and 5th centuries. The first took place A.D. 197, on the question of the date of the observance of Easter; and the second in 245, against the heresy of Noëtus.

The third council, 431, was the third oecumenical council of the Church, and dealt especially with the Nestorian controversy on the person of Christ (*see* Nestorians). Cyril, archbishop of Alexandria, had denounced Nestorius, and the emperors Theodosius and Valentinian convoked a general council to decide the matter. The council confirmed the Nicene Creed, condemned the heresy of Nestorius, and also settled certain points of discipline. The fourth council, 440, and the fifth, 447, met to decide a question of episcopal succession. The sixth or robber council, convened by Theodosius in 449, dealt with disputes about individual bishops and clergy, but its general findings were tainted by outside influences and were superseded by the council of Chalcedon in 451.

**Ephialtes** (d. 456 B.C.). Athenian statesman and democratic leader, who opposed Cimon (*q.v.*), the leader of the aristocratic party, and was associated with Pericles. Among the reforms of Ephialtes was the limitation of the power of the Areopagus. He is not to be confused with the traitor of the same name who, when Leonidas and his Spartans were defending the pass of Thermopylae in 480 B.C. against the Persians, showed the enemy a path whereby the defenders of the pass could be taken in the rear. In Greek mythology, Otus and Ephialtes were giants, who rebelled against the gods, and endeavoured to pile Ossa on Olympus and Pelion on Ossa. *Prom. Effi-alteez.*

**Ephod.** Symbolical waistcloth worn by the Jewish priests when officiating. That worn by the high



Ephod. Jewish high priest wearing the ephod, shown knotted below the breastplate

priest was of fine linen, coloured gold, blue, purple, and scarlet, worn over a blue robe, fastened round the body by a girdle, and supported by two shoulderstraps, each ornamented with an onyx stone inscribed with the names of six of the 12 tribes. Attached to the front of it was

the breastplate (*q.v.*). References are made in Exodus 28, 29, 39; Lev. 8; Judges 17; 1 Sam. 2 and 22; 2 Sam. 6.

**Ephor** (Gr. *ephoros*, overseer). Spartan official. Originally appointed by the kings to take over certain police and judicial duties, the ephors gradually became the most influential body in the state. After the second Messenian War (685-668 B.C.), they became an independent magistracy. Five in number, and elected by the Apella (the Spartan general assembly), they held office for a year. They possessed civil jurisdiction, looked after public morals, had the right of dismissing, fining, and imprisoning public servants, and even the kings were subject to their authority. Two of them accompanied the king in the field to keep a watch on his movements. They summoned and presided at the public assemblies, controlled the finances, and conducted negotiations with the representatives of foreign powers. When Agis IV tried to limit their authority, he was imprisoned by their order, and murdered (240). The ephorate was abolished by Cleomenes III, but restored after he lost the throne in 221, although it never recovered its former position. *See* Sparta.

**Ephraem Syrus** or **EPHRAIM THE SYRIAN** (c. 306-378) Theologian and sacred poet. A native of Nisibis, where he spent his youth in study, about the year 363 he removed to Edessa, where he lived the life of a hermit, and was ordained deacon. He devoted his life to teaching and writing, and assisted the poor during a great famine.

**Ephraim.** Second son of Joseph. With his brother, Manasseh, he was adopted by their grandfather Jacob, and their descendants were reckoned among the tribes of Israel. Ephraim took precedence of his elder brother Manasseh, but nothing is known of his personal career. The tribe of Ephraim occupied part of the northern territory of Palestine. Joshua belonged to this tribe.

**Ephrath** or **EPHRATHAH** (fruitful). Old name for Bethlehem (*q.v.*), in Palestine.

**Epi.** This is a French architectural term denoting a small finial (*q.v.*).

**Epiblast** (Gr. *epi*, on; *blastos*, shoot). Term used in embryology for the outer covering of the organism when it has reached the stage of a three-walled sac or gastrula. *See* Ectoderm.

**Epic** (Gr. *epos*, tale, song). Name given to narrative poetry which deals in dignified and elevated style with some important action,

usually heroic. The great examples are the *Iliad* and *Odyssey* of Homer, which are unmatched in any other language. Other peoples and later ages, however, produced poetry descriptive of great events to which the term epic has been generally and legitimately applied, such as the French Song of Roland and the English *Beowulf*. These all belong to the authentic, as distinguished from the literary, type, that is, they are "poems of growth," not the work of a single age or author, but stitched together by generations of bards from the myths and traditions of their race, embodied in older and more primitive lays and ballads. Such poems are important as historical documents. Though mingling fiction with fact, they preserve irreplaceable accounts of the manners and customs, and the political, social, and religious ideas of times otherwise unchronicled.

#### English Epics

*Beowulf*, for example, raises the curtain which hides the early life of our forefathers, and in its persons, scenes and episodes reveals many of the mental and moral characteristics of the race, as well as elements of the social order which still prevails in the British islands. Several other narratives which fall short, indeed, of the unity and completeness of the more famous heroic poems, still display many of their essential features, like the English *Maldon*, a splendid though comparatively late piece of the 11th or 12th century. Rhymed chronicles like Layamon's *Brut* partake of the epic character in that they contain fragments of actual history and are heroic in scope and intention, but deficient in plan and insufficiently elevated in style to bear comparison with the *Iliad* or *Paradise Lost*. *Paradise Lost* belongs, like Virgil's *Aeneid* or Tasso's *Gerusalemme Liberata*, to the artificial, invented or literary type. These are imitative poems, written in the epic manner by learned authors in epochs of advanced civilization. They are the works of bookmen, who describe events of which they had no personal knowledge and their value and interest rest wholly upon the imagination and poetical skill at work in their construction.

Few such attempts were greatly successful; nevertheless, since they followed the tradition and endeavoured to treat a noble subject worthily, they are properly to be styled epic. The Renaissance, on the other hand, produced many chivalric and romantic narratives, of epic dimensions certainly, like those of Ariosto and Spenser. Some are humorous, some serious, but

even when serious, and however charged with poetic quality—since they forsook the region of the heroic, of events that might have happened, for the region of the symbolic, marvellous, or incredible—have little in common with the true and original types. In the mock-heroic, like the classical *Batrachomyomachia*, or *Battle of the Frogs and Mice*, or Pope's *Rape of the Lock*, the manner and machinery of epic poetry are imitated, the great style applied to the trifling subject, with humorous intention or for the purposes of parody or burlesque. In modern times probably the nearest approach to the epic spirit is realized in *The Dynasts* of Thomas Hardy. See Poetry.

**Epicharmus** (c. 540–450 B.C.). Greek comic poet. Born in Cos, he went early to Megara in Sicily, but after its destruction in 483, he removed to Syracuse, where he enjoyed the patronage of the "tyrants" Gelo and Hiero. The chief representative of the Dorian or Sicilian comedy, his 35 plays written in the Doric dialect, of which only scanty fragments remain, dealt chiefly with mythological subjects (Busiris, the shipwrecked Odysseus, the Sirens). They were distinguished by rapidity of action, in which, according to Horace, they served as a model for Plautus.

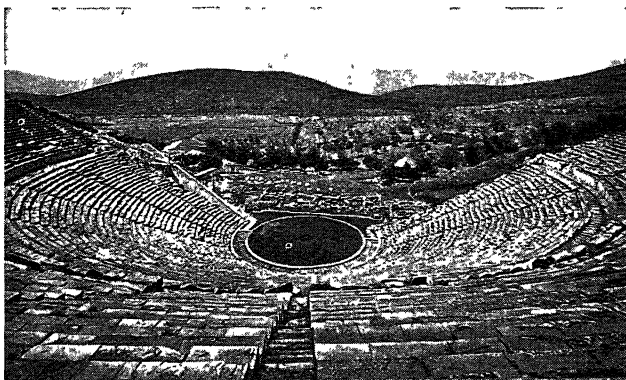
**Epictetus**. Stoic philosopher who lived about 100 A.D. Born at Hierapolis in Phrygia, he was taken as a slave to Rome. Having been given his freedom, he became an adherent and teacher of Stoicism, and when Domitian expelled the philosophers from Rome, Epictetus removed to Nicopolis, in Epirus, where he lived until the reign of Hadrian. One of his pupils, Arrian the historian, published his *Discourses* and a *Manual* of his doctrines. The latter and four books of the *Discourses* are extant. According to Epictetus, we are only concerned with things that are under our control; all other things are *adiaphora* (indifferent). The good is that which corresponds to reason and the general moral ideas implanted in us; the bad is that which runs counter to them. The highest principles of life are patience, abstemiousness, and self-control. Epictetus assumed the existence of *daimonia*, spirits which, like that of Socrates, accompanied man everywhere and acted as his guardians through life.

**Epicureanism**. The doctrines of the school founded by the Greek philosopher Epicurus (341–270 B.C.). He was of Athenian parent-

age, and born in Samos. Coming to Athens, he founded his school in his Garden, which became as famous as the Stoic Porch about 306. Epicurus divided philosophy into three parts: Canonics (logic, the theory of knowledge), Physics, and Ethics. The basis of all knowledge is the evidence of sensual perception; all perceptions are true and irrefutable. Opinions are true or false,

greater circle. In Ptolemy's system of the heavens each of the "seven planets" was supposed to revolve in an epicycle. This obsolete explanation describes with approximate truth the relative motion of a planet with regard to the earth, if the earth is assumed to be stationary.

**Epidaurus**. Town of Argolis, ancient Greece, situated on the Saronic Gulf. It was famous for its



Epidaurus, Greece. Although this theatre dates from the 4th cent. B.C., nearly every one of the 16,000 stone seats is still in position; the foundations of the stage buildings are seen beyond the circular orchestra.

according as they are confirmed or refuted by perception.

In physics Epicurus agrees in the main with Democritus, the founder of the atomic theory. Bodies are formed by the collision and combination of an infinite number of atoms in infinite space. The number of worlds also is infinite. The gods, made of the finest atoms, do not trouble about the world or human affairs, but live happily in the empty spaces between the different worlds. The soul is material, made up of the finest atoms dispersed throughout the body. There is no such thing as immortality; after death the soul-atoms are scattered. Sensation is due to effluxes and images, which issue from the surface of things and pass through the air to the sight or understanding.

In ethics Epicurus follows the Cyrenaics. Pleasure is the aim of life, the only happiness. No pleasure is bad in itself, but only pleasure in rest—freedom from pain—is a true good. The virtuous man, he who rightly pursues pleasure, is alone happy.

Epicureanism is used today of addition to sensual enjoyment, more particularly that of the table. See Ethics; Philosophy.

**Epicycle** (Gr. *epi*, upon; *kyllos*, circle). A circle, the centre of which moves along the circumference of a

temple of Asclepius (Aesculapius), the god of healing, about 8 m. distant, which was extensively visited by the sick from all parts of Greece. Miraculous cures similar to those at Lourdes are recorded. Excavations carried on since 1881 have revealed remains of the temples of Asclepius and Artemis, of a tholos or rotunda, and inscriptions connected with the worship of Asclepius. Outside the sacred precincts is the loveliest and best preserved of the theatres of classic Greece. It was designed by the younger Polyclitus (4th cent. B.C.). The original fully circular orchestra is still visible. The auditorium seated at least 16,000 people, and the acoustics were so good that a performer speaking in ordinary tones could be heard from every seat in the auditorium.

**Epidemic** (Gr. *epi*, in; *dēmos*, people). Occurrence of a disease among a number of persons about the same time. When a disease is continually present in a locality the term endemic is applied to it. A pandemic is an outbreak of a disease which extends over the whole or a large part of the world. In the Middle Ages, when sanitation was non-existent, epidemics were of frequent occurrence and were usually regarded as manifestations of divine wrath. Later the communicability of the disease from one



person to another was recognized, and the cause of the outbreak was looked for in climatic occurrences or cosmic phenomena—for example, the influence of a comet.

In the 18th and 19th centuries more scientific views were gradually established, and it was recognized that the disease was conveyed from one to another by some morbid or poisonous agent, which was eventually found in most cases to be a bacillus or other micro-organism. Epidemics are spread by various agencies. Pollution of drinking water by sewage has been the commonest cause of outbreaks of cholera and typhoid fever. Epidemics of diphtheria have frequently been spread by contaminated milk. In other cases insects or animals have been the transmitting agent. Typhus fever, for example, is conveyed by the bite of the louse, and plague by the rat flea. Airborne infection has been confirmed as the method of transmission of influenza, of scarlet fever, and of smallpox. Epidemics may also be caused by wholesale contamination of food with poisonous substances. In 1900 there was an epidemic of arsenical poisoning in the N. of England due to the contamination of beer with arsenic derived originally from arsenical iron pyrites from which sulphuric acid used in the manufacture of the beer had been made. Epidemics of lead poisoning have also followed the contamination of drinking water by lead derived from cisterns and conduit pipes.

The prevention and arrest of epidemics necessitate active measures which vary with the particular circumstances controlling the disease. Some system of notification of affected persons, followed by their isolation, is important. This is possible only in advanced communities and where the severity of the disease justifies the course and the numbers are not too great to cope with. It could be followed in Great Britain during outbreaks of smallpox, but would be a difficult matter with influenza. Public health is now an important department of medicine, dealing with preventive measures against widespread outbreak of disease, and limiting such an outbreak should it occur. See Plague; Public Health.

**Epidendrum** (Gr. *epi*, on; *den-dron*, tree). Large genus, mainly

of epiphytes, of the family Orchidaceae. They are natives chiefly of S. and Central America and the W. Indies. They have leathery, strap-shaped leaves, and



Epidendrum. Typical flower bud and leaves

flowers solitary or disposed in spikes or sprays. The characteristic features of the genus are the union (more or less complete in different species) of the fleshy base of the lip to the column, a passage at the base of the lip, and the four compressed pollen-masses. Some of them have handsome flowers, but in many species these are of a dingy green hue.

**Epidermis** (Gr. *epi*, on; *derma*, skin). Name for the superficial layer of the skin, lying above the *cutis vera* or true skin. It is formed by a number of layers of cells, the most superficial of which consist of stratified epithelium, and are horny in character. These form the thickest part of the epidermis. Beneath the horny layers are several layers of clear rounded cells forming the *stratum lucidum*; next is a layer of granular cells, the *stratum granulosum*. In these strata the change from protoplasm to horny material takes place. The deepest layers constitute the *rete mucosum* or Malpighian layer, and consist of soft protoplasmic cells. The epidermis grows from the deeper layers, the superficial horny cells being continually shed. It has no blood vessels, but fine nerves ramify in the deeper layers. The term is used also for the cuticularised superficial cell layer in plants. See Skin.

**Epidiascope** (Gr. *epi*, on; *dia*, through; *skopein*, to look). Apparatus of the optical lantern type. Originally intended for projecting on to a screen images of opaque bodies such as insects, coins, diagrams, etc., in their natural colours, it can also be used for projecting transparent objects; e.g. lantern slides and microscopic preparations can be shown with considerable magnification. The illumination is provided by lamps located at the focus of parabolic mirrors; the light is thrown upon, or transmitted through, the object by a system of condensers and mirrors. An epidiascope enlarger is used in the dark room for making photographic prints from negatives on opaque substances.

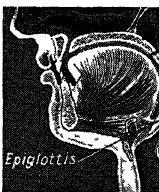
**Epididymis** (Gr. *epi*, on; *didymos*, testicle). In anatomy, a convoluted tube which receives the

ducts from the testis, and is prolonged into a tube, the *vas deferens*, through which the seminal fluid passes to the urethra.

**Epidiorite**. Crystalline rock derived by metamorphism from basalt or dolerite. By alteration original augite is converted to hornblende, and the rock assumes the general mineral assemblage of a diorite (*q.v.*). Epidote, chlorite, sphene, and quartz are usually present as secondary minerals. It is common in the Scottish Highlands and other areas composed of ancient metamorphosed rocks.

**Epidote**. Basic silicate of calcium and aluminium. It is found abundantly, but outside Austria and America is rarely of sufficient transparency and fine colour to be cut as a precious stone. The colour ranges from green to brown. Its specific gravity is from 3.25 to 3.5. Piedmontite is a manganese epidote originally found in Piedmont, some valued specimens being characterised by a magnificent cherry-colour. Epidote is formed by metamorphism of lime-rich rocks.

**Epiglottis** (Gr. *epi*, on; *glossa*, glotta, tongue). Thin leaf-shaped structure, consisting of fibro-cartilage, placed behind the root of the tongue and in front of the superior opening of the larynx. It was

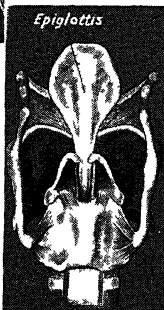


formerly supposed that it was bent back during the act of swallowing and served as a lid to close the larynx; but it is now recognized that the closing of the glottis is effected by the arytenoid and thyro-arytenoid muscles.

**Epigoni** (Gr., descendants).

In Greek legend, the sons of the seven heroes who fell in the war against Thebes. See Adrastus.

**Epigram** (Gr. *epi*, upon; *gramma*, a writing). Originally a simple inscription attached to religious offerings. It was afterwards written on the temple gate, and by easy tradition passed to other public edifices and to statues of gods, heroes, and all who had dis-



Epiglottis seen from the front. Upper picture, sectional diagram showing position of this structure in the throat

tinguished themselves by patriotism, courage, and virtue. The term at first included inscriptions in verse or prose, and the form was employed by legislators and philosophers to convey any political or moral precept, its brevity impressing it readily upon the memory. Finally, among the Greeks, the epigram came to signify any short piece of poetry which conveyed a single idea with neatness and grace. The Greek Anthology contains epigrams characterised by delicacy and truth of sentiment, and by elegance of expression, and entirely devoid of satire, play upon words, and even of conceit. Even in the lighter convivial epigrams the thought is generally of a melancholy cast, and the sepulchral inscriptions show simple delicacy and perfect appropriateness.

In the hands of the Latin epigrammatists the epigram acquired a new character. The term was now applied to any brief and concise composition in prose or verse, in which a single idea was expressed and the point made by antithesis, surprise, or play upon words. Catullus and Martial are the acknowledged masters of the Latin verse epigram, Tacitus of its prose equivalent. Despite much conceit and some obscenity Catullus excelled all other Roman wits in elegance and beauty, while Martial stands supreme in wit and fecundity, in brevity, smartness, and variety. As used by Martial, and in the modern sense, the verse epigram has been defined as a short poem, generally of a personal character, meant to vex somebody, to pay off an old score, or to be smart at someone else's expense. In the best examples the point is made unexpectedly in the last word, wherefore the epigram has been compared to the scorpion because "as the sting of the scorpion lyeth in the tail, so the force and virtue of the epigram is in the conclusion."

#### Modern Writers of Epigrams

Of modern literatures the Italian contains the nearest approximations to the Greek epigram in respect of feeling, though not of simplicity, in the softly melodious, elegant, and pathetic songs of Metastasio and the amatory verse of Guarini, Tasso, and others. Pananti, in the early 19th century, wrote epigrams notable for their causticity, political allusion, and boldness. The French madrigal is sometimes written in the spirit of ancient Greece, and is often unequalled in condensation of thought, happiness of epithet, and

delicacy of turn. Voltaire, however, is the supreme French epigrammatist, writing on every conceivable subject and with every degree of merit.

English literature is deficient in the serious and tender style of epigram, but singularly rich in the witty and satirical. The 18th century was the flowering time of the English verse epigram, which was admirably suited to the malicious wit of Pope, the whole of whose poetry, indeed, is a string of epigrams. As epigrammatist, he stands head and shoulders above all other English poets. Owing to their vagueness and inappropriateness, his epitaphs are notoriously bad, but his epigrams are of the highest polish and point. His epigram on epitaphs, addressed to Dr. Robert Freind, headmaster of Westminster School, runs thus:

Freind, for your epitaphs I'm grieved;  
Where still so much is said,  
One half will never be believed,  
The other never read.

**Epigraphy** (Gr. *epi*, on; *graphein*, to write). Study of inscriptions. In practice it concentrates upon inscriptions on durable materials such as stone, metal, and wood, including coins, gems, ornaments, seals, vases, and weapons, whereas palaeography studies the forms of writing upon papyrus, parchment, and paper. When concerned with form it is a branch of palaeography, but in addition it deals with subject-matter. Important departments are Chinese, Greek, Hittite, Latin, Indian, Runic, and Semitic epigraphy. See Inscriptions; Palaeography.

**Epilepsy** or **FALLING SICKNESS** (Gr. *epilepsis*, seizure). Disease of the nervous system characterised by periods of unconsciousness. Two forms are recognized: *petit mal*, or minor epilepsy, in which convulsions do not occur; and *grand mal*, or major epilepsy, marked by the occurrence of convulsions or fits. Epilepsy may begin before the fifth year; first indication of the disease after thirty is less common. The fundamental cause is unknown, though fright, injury, and an attack of illness sometimes appear to be exciting causes. Hereditary influences play a part, the offspring of those who suffer from insanity or neurasthenia being rather more prone to exhibit epilepsy than other children. In *petit mal* the attacks of unconsciousness often last no longer than a few seconds. The individual may suddenly stop talking and his eyes stare fixedly; after a few moments he resumes his talk as if nothing had happened.

*Grand mal* is characterised by the occurrence of convulsive fits. In many cases the subject has a preliminary sensation or *aura*, which warns him of what is going to happen. This may take the form of tingling or sensation of heat or cold in the limbs or face, flashes of light before the eyes, noises or voices in the ears, or uneasy sensations in the stomach. After an interval of varying duration the patient suddenly loses consciousness, and may fall to the ground without making any effort to save himself. Sometimes the beginning of the fit is marked by a loud cry. At first the muscles are rigid; the jaws are clenched, the limbs extended, and suspension of respiration causes blueness of the face. After a few seconds, violent convulsions occur; the limbs are jerked about, the muscles of the face twitch, and the tongue may be severely bitten. After one or two minutes the patient passes into a state of coma which may be succeeded by prolonged sleep. In severe cases fits may rapidly follow each other, and consciousness may not be regained in the intervals.

#### Variant Forms of the Disease

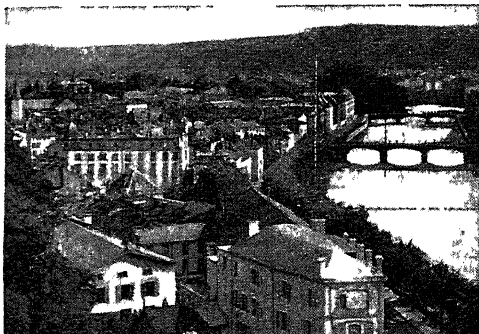
Masked epilepsy is a form in which the fits are replaced by attacks of delirium or outbursts of maniacal fury, during which the sufferer may commit crimes of brutal violence or destroy himself. In another form there is loss of memory. A person may leave his home and wander about the country, behaving like a normal being, but having forgotten his previous life or even his name. After an interval his old self returns and he has no knowledge of what has happened in the interval.

Jacksonian epilepsy is a condition in which consciousness is not lost, and the spasms affect only part of the body. The condition is probably quite distinct from true epilepsy; it is the result of some irritation of the brain, and may be due to injury.

In epilepsy, characteristic electrical discharges occur in the brain. These can be recorded on the electro-encephalogram, an instrument used in diagnosis.

During an actual fit all that can be done is to prevent the patient from hurting himself. He should be allowed to remain in the recumbent posture, the clothes should be loosened round the neck, and a roll of cloth should be introduced between the teeth to prevent the tongue from being bitten.

The most useful drugs in the treatment of epilepsy are the bromides of sodium and potassium and the phenobarbitone family. These should be given for possibly two years, the amount and frequency of the dose depending upon the severity of the condition, the age of the patient, and the manner in which he reacts to treatment. Enough should be given to ward off recurrent attacks, which weaken mental power.



Épinal, France. The town, looking up the Moselle towards the wooded Vosges Mountains

An epileptic should lead a quiet life. He should not take alcohol; and his meals should be light and moderate. It is better for the patient to be at work or occupied, provided the occupation is not one which subjects him to danger if a fit occurs. When epilepsy develops, a thorough examination should be made in order to eliminate any possible sources of reflex irritation such as adenoids, worms in the intestine, etc.

**Epilogue** (Gr. *epilogos*, conclusion, peroration). Short address in prose or verse frequently employed to round off a dramatic performance; sometimes in the form of an appeal to public favour for the play it followed, sometimes explanatory or even apologetic. Many of the plays of Shakespeare and other great dramatists were provided with epilogues. In the 17th and 18th centuries the epilogue was frequently written by a friend or patron of the playwright. The use of the epilogue, as of the prologue, went out of fashion before the close of the 19th century, except on special occasions. The term was adopted by the B.B.C. for a short Sunday evening service of texts and singing, first broadcast in 1926.

**Epimenides**. Greek legendary priest and miracle-worker. A native of Crete and associated with the worship of the Cretan Zeus and Apollo, he was summoned to

Athens in 596 B.C. to purify the city from the curse of Cylon (see Alcmaeonidae). He was the author of oracular and purificatory poems, and is supposed to be the "prophet" of St. Paul's epistle to Titus (1, v. 12), according to whom the Cretans were "always liars." Some regard him as an entirely mythical character. *Pron.* Epipi-menni-deez.

**Épinal**. Town of France. The capital of the dept. of Vosges, it is situated on both sides of the Moselle, 190 m. E.S.E. of Paris. It makes embroidery, hats, images, and has long been noted for the production of pictures for children. It has extensive quays and promenades. With Belfort, Verdun, and Toul it formed, during the First Great War, the first line of French permanent defences along the lines of the Moselle and the Meuse. The fortress of Épinal was built after the Franco-Prussian War, and was one of France's most important works of defence. There is a monument to the French who fell in the war of 1870-71. A 12th century tower is preserved as part of the church of St. Maurice. The town has been French since 1766. Pop. 23,395.

**Épinay**, LOUISE FLORENCE PÉTRONILLE D'ESCLAVELLES D' (1726-83). French author. Born at Valenciennes,



Louise d'Épinay,  
French author  
After Liotard

March 11, 1726, she married in 1745 her cousin Denis de la Live de Bellegarde, who soon afterwards deserted her. Her charm and literary ability made her many friends among writers of her day, J. J. Rousseau, Voltaire, Diderot, and Grimm among others. For Rousseau she built in 1756 the Hermitage, in the valley of Montmorency; the story of their intimacy is told in his Confessions, but after little more than a year they quarrelled. She died April 17, 1783.

Her chief writings were her *Mémoires*, published in 1818, a lively picture of her literary circle

and Parisian society, the names being fictitious, and her *Conversations d'Émilie*, 1774, crowned by the French Academy, 1783.

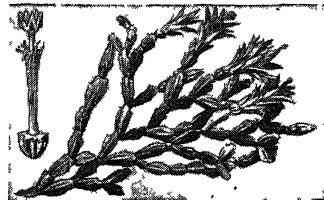
**Epiphany** (Gr. *epiphainein*, to manifest). Festival of the Christian Church, celebrated on Jan. 6. The English Prayer Book title is The Epiphany, or The Manifestation of Christ to the Gentiles. Formerly the Epiphany seems to have been part of the festival of Christmas, which lasted twelve days. It commemorated the manifestation of Christ's birth to the Magi (which in medieval times was associated with a mass of picturesque legends), the manifestation of the Trinity at Christ's baptism, and Christ's first miracle at Cana.

In the Greek Church the festival is a special day for baptism.

In England on this day it was customary for the sovereign to offer gold, frankincense, and myrrh at the altar. Since the time of George III this offering has been made at the Chapel Royal, St. James's, by an officer of the royal household. *See* Calendar; Twelfth Day.

**Epiphora** (Gr., bringing upon, sudden attack). Persistent overflow of tears down the cheek, usually due to obstruction of the lachrymal duct. *See* Lachrymal Gland and Duct.

**Epiphyllum** (Gr. *epi*, on; *phyllo*, leaf). Small genus of climbing sub-shrubs, members of the family



Epiphyllum. Fleshy branches and flowers of *Epiphyllum truncatum*, a Brazilian cactus

Cactaceae. They are natives of Brazil. They have thin cylindrical stems, 2 ft. or 3 ft. high, with short, fleshy, leaf-like branches, whose broad ends produce large, showy flowers of pink or crimson hue.

**Epiphysis** (Gr., on-growth). Part of a bone which develops from a separate centre of ossification and is at first attached to the main part of the bone by cartilage, which ultimately is replaced by bone. In the humerus, or upper arm bone, for instance, the upper end forms an epiphysis which is not united to the shaft by bony union until about the 20th year, and the lower end is another epiphysis which unites about the 16th. *See* Arm; Elbow.

**Epiphytes** (Gr. *epi*, on; *phyton*, plant). Plants which, instead of being rooted in the soil, grow upon the surface of other plants, chiefly trees. Large numbers of the tropical orchids are of this character, and are therefore known as epiphytic orchids. Some ferns and mosses have the same habit. True epiphytes do not derive any of their nutriment from their hosts, and are often called air-plants.

**Epirus** (Gr. *ēpeiros*, mainland). Country in the N.W. of ancient Greece. It was bounded by Illyria, Macedonia, and Thessaly on the N. and E., and by the Ionian Sea on the W. The original inhabitants were so-called Pelasgians, like those in other parts of Greece, but the Epirotes of historical times were a mixed race. The most famous king of later times was Pyrrhus (d. 272 B.C.), who seriously challenged the power of Rome. In Epirus was the celebrated oracle of Zeus at Dodona.

The modern district of Epirus extends from N.W. Greece into

S. Albania. It covers an area of 3,688 sq. m. and had a pre-war pop. of 363,041. In Epirus during the Second Great War the Greeks defeated Italian forces in Oct.-Nov., 1940, and resisted the Germans from the invasion in April, 1941, until the territory was liberated in Nov., 1944.



**Episcia.** Foliage and bloom of this Central American plant

**Episcia.** Genus of perennial herbs, members of the family Gesneriaceae. Natives of Central America and the West Indies, they have opposite leaves and beautiful funnel-shaped flowers. In colour they are white, flesh-tinted, lilac, vermilion, or crimson.

logy (contrast the Eastern Orthodox and Anglican view, according to which the three "orders" of the ministry are those of bishops, priests, and deacons), bishops and presbyters, notwithstanding the fact that bishops are specifically "consecrated" as such and hold authority over the presbyters, are reckoned as together constituting the single "order" of priesthood, the other two sacred "orders" of the ministry, according to the R.C. reckoning, being those of deacon and sub-deacon.

Whatever may have been the precise functions of "bishops" in the earliest period of all, and whether or not they were differentiated in any specific fashion from "presbyters," they appear in the N.T. as ministers of local "churches," holding office in subordination to the general oversight of the apostle or other "missionary" by whom their "church" had been founded. The second Christian generation inevitably found the local "churches" deprived of such supervision by "apostles" or "missionaries." The local "bishops" succeeded no less inevitably to many of the functions of the original "apostles." They were the local rulers of the church, administered its discipline (probably with the help of the presbyters), were its principal teachers, and were the normal ministers of its sacraments and leaders of its worship.

#### Church Rule in the 2nd Century

The system reflected in the epistles of S. Ignatius (an early 2nd century martyr-bishop from Antioch in Asia Minor) quickly became universal. At the head of each local church there was a bishop, who in the general control of the church was assisted by presbyters. At the church's assembly for worship the bishop presided at the Eucharist, flanked by presbyters upon either side, and assisted by deacons. "Nothing apart from the bishop" is the slogan of these epistles: if the bishop himself was not able to preside at the Eucharist, the celebrant must be someone deputed by him—presumably one of the presbyters. At the stage represented by the Ignatian letters, the local church in each city was probably still small enough numerically to be assembled together for worship in one "congregation." As numbers grew, and the bishop's "diocese" (a word which means literally "sphere of administration") expanded, the formation of branch congregations would be inevitable; presbyters were put

## EPISCOPACY: CHURCH RULE BY BISHOPS

**Rt. Rev. A. E. John Rawlinson, D.D., Lord Bishop of Derby**

*The origin in earliest Christian times and the subsequent development of the system of church government by bishops, found, with certain differences, in the Anglican, Eastern, and Roman Catholic communions, are here described. See Anglicanism; Church of England; Diocese; Roman Catholic Church, etc.*

The word episcopacy, meaning the system whereby spiritual authority and pastoral oversight in the Christian church is entrusted primarily to bishops, is derived from the Greek *episkopos*, one who exercises oversight. A distinction corresponding to the later distinction between clergy and laity existed in Christianity from the beginning, the original "ministry" of the church consisting of the apostles chosen by Christ. Other orders of ministers quickly began to emerge—in the N.T. there is reference to the appointment of "presbyters" (Acts 14) and to the existence of "bishops and deacons" (Phil. 1), though their respective functions cannot be precisely determined, and, originally, the chief pastoral oversight of the developing church was in the hands of the "Twelve" (the place of the traitor Judas having been filled, according to the narrative of Acts 1, by the appointment of Matthias), though an authority equal with theirs was conceded to S. Paul as the apostle to the Gentiles (Gal. 2; 1 Cor. 9) and apparently also to Barnabas, and a position of special importance was occupied also by James, the Lord's

brother (Acts 15, Gal. 1). The pastoral epistles (1 and 2 Timothy, and Titus) imply the exercise of authority over groups of local churches by their respective recipients, apparently as delegates left in charge by S. Paul. In 1 Timothy and in Titus, there are passages referring both to "bishops" (1 Tim. 3; Tit. 1) and to "presbyters" (1 Tim. 5; Tit. 1). It has been thought that in Tit. 1 "presbyter" and "bishop" may be two names for the same office; and, on the other hand, in 1 Tim. 5 the context suggests that the term "presbyter" (which means literally "an older man") is used in its etymological significance rather than as the designation of an office in the church (cf. Tit. 2, where, however, a variant term is used in the Greek original).

The view has been widely held that originally "presbyters" and "bishops" were the same (cf. Acts 20, v. 17 with 20, v. 28), or at least that, when the two were distinguished, the term "bishop" denoted simply a presbyter entrusted with special functions of "oversight" which his fellow-presbyters did not in all cases share. To this day, in R.C. theo-

in charge of them, with the result that many of the bishop's liturgical and other functions came to be habitually and normally shared by presbyters, who developed into what (to use a later term) might be called "parish priests," exercising a subordinate "cure of souls" under the bishop.

In the developed system of later centuries, the only liturgical functions exclusively reserved to the bishops were those of taking part in the consecration of fellow-bishops, ordaining men to the ministry (in the case of an ordination to the presbyterate or "priesthood," with the assistance of presbyters), and (in the Western part of the church) confirming or "sealing" the baptized. Yet the bishop of each diocese remained still the chief pastor of the church under his jurisdiction. His diocese might come to include numerous "parishes," he might have large numbers of clergy working under him, he might have an assistant bishop or bishops (commonly called "suffragan" bishops) to help him; but he remained still the one bishop of the diocese, the representative of his church in relation to neighbouring churches, and within his own area supreme.

#### The Unit of Church Government

In the countries surrounding the Mediterranean sea the normal area of a bishop's diocese has throughout the centuries continued to be quite small, each of the leading cities (and many quite small ones) becoming eventually the seat of a bishopric. In northern and western Europe, and (with the spread of Christian missions) in many other parts of the world, dioceses were as a rule (and still are) very much larger. Large or small, however, wherever episcopacy obtains, the diocese, under its bishop, remains the primary unit of the ordered life of the church. The grouping of dioceses into provinces, each under an archbishop, or (in the Eastern Church) into patriarchates, each under a patriarch, does not radically affect the truth of this generalisation, the powers of an archbishop or of a patriarch in relation to dioceses other than his own being of a strictly limited kind. Only in the R.C. Church (more especially since the adoption in 1870 of the constitution *Pastor Aeternus*) is the claim made that a particular bishop exercises, as the successor of S. Peter, a direct and immediate jurisdiction over all other bishops, and, indeed (according to the R.C. view), over all Christians everywhere.

In the 16th century the bishops in most countries affected by the movement of reform in the church refused their support to the Reformation, with the result that a breach with Rome was found to involve also a breach with the episcopate. Both in England and in Sweden an episcopate with continuous succession was maintained, but the succession elsewhere was broken. The (Lutheran) churches of Norway and Denmark have retained titular bishops, though with a broken continuity and without specific consecration to episcopal office; and the title and office of "bishop" (here also without continuity of succession) have been revived in some protestant areas of modern Germany, and by "Methodist Episcopalians" in the U.S.A.

#### Free Churches Reject Episcopacy

The majority of Protestant churches at the time of the Reformation adopted forms of church government in which no provision was made for episcopacy. In England the Puritan party in the church disliked and attacked the episcopal system and eventually seceded from the church. Their spiritual successors—the English "Free Churches"—have no bishops in their churches, and are traditionally hostile to episcopacy. Yet it is noteworthy that in quite recent times many of their leaders have come to recognize that, in any future scheme for church reunion, the acceptance of the episcopate as "the means whereby the authority of the whole church is given" to the ministers of the church at their ordination would be inevitable, and that "it ought to be accepted as such." So, too, in the proposed scheme for a united church of S. India it is laid down that the future church shall be organized in dioceses under the pastoral oversight of bishops.

In the Church of England, while there is an acceptance of episcopacy in practice, there are divergent views held as to its necessity. One school of thought maintains that in strictness the ordination of the clergy by bishops duly consecrated through a succession of ordinations and consecrations continuous with the church's past, and going back to the original days of the apostles, is essential for a "valid" and duly authorised ministry; another school, while regarding episcopacy as (upon the whole) the most desirable form of church government, would refuse to go further than this, or to regard as "invalid" (even in a technical sense) the ministries of churches

which do not possess or claim any "apostolic succession" based upon ordination at the hands of validly consecrated bishops.

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**Episcopius**, SIMON (1583–1643). Dutch theologian whose family name was Bishop. He was born at Amsterdam, Jan. 1, 1583, and educated at Leyden, where he came under the influence of Arminius (*q.v.*). In 1612 he was appointed to a chair at Leyden university, and became recognized as the leader of the Arminians against the Calvinists. He took a prominent part in the synod of Dort in 1618, with the result that he was deprived of office and had to live for a time in France. About 1626 he returned to Holland, and became rector of the Remonstrant College at Amsterdam, where he died April 4, 1643. His *Confessio, Apologia pro Confessione, et Institutiones Theologicae* are the standard works on Arminianism.

**Episode** (Gr. *epi*, on, in addition; *eisodios*, coming in). (1) In ancient Greek tragedy, that part of the dialogue which comes between the choric songs. (2) In music, part of a composition in which some departure is made from the main theme, or form, for the sake of variety. In the fugue form, the episodes allow the use of fragments of the subject matter, varied treatment of the subject, entries at irregular intervals of time and pitch, and free changes of key. In sonata and rondo forms, episodes are of the nature of second subjects, but of less importance than the true second subject which appears again fully in the recapitulation section. (See Rondo; Sonata.) (3) In literary composition, a minor event or incident introduced to give variety to a narrative, or to illustrate a character or event. A story, for instance, is said to be episodic when it consists of loosely knit incidents, or where the incidents do not merge together in a natural succession and harmonious whole.

**Epistaxis** (Gr. *epi*, on; *stazein*, to drip). Bleeding from the nose. This may be caused by injury, by an unhealthy mucous membrane, or it may be associated with influenza or some of the fevers. Local congestion due to a diseased

tooth can give rise to obstinate nose bleeding. The cause of recurrent nose bleeding is often a small network of varicose veins in the nasal mucous membrane, and this answers immediately to treatment with an electric cautery. Simple nose bleeding is usually stopped by applying cold compresses over the nose and to the nape of the neck. The nose should not be blown. The bleeding nostril should be plugged.

**Epistemology** (Gr. *epistēmē*, knowledge; *logos*, theory) Theory or science of human knowledge. It investigates the origin and limits of knowledge; defines the part played in it by experience and thought respectively; and examines the formation, meaning, and employment of its fundamental notions.

**Epistle** (Gr. *epistolē*, message, letter). Term generally applied in English literature to verses written in the form of letters addressed to specific persons, or to readers generally, as in the epistle dedicatory. In the former sense it was a revival of the use of the epistle by Horace and other classical poets. Satiric or moral epistles, such as Pope's *Essay on Man* and *Moral Essays*, more or less on the Latin model, were a notable feature of English literature in the 18th century, at the close of which Burns gave the epistle an easier and freer form.

There are examples of epistles in the O.T. and in the O.T. apocryphal pseudepigraphic writings; but the famous letters or epistles of the Bible are confined to the N.T. The chief writer is the apostle Paul, to whom thirteen Epistles are ascribed. These are commonly divided into four groups (1) 1 and 2 Thessalonians, written from Corinth in A.D. 52 or 53. (2) Galatians, 1 and 2 Corinthians, and Romans, written in A.D. 57-58. (3) Ephesians, Philippians, Colossians, and the Epistles of the (first Roman) Captivity, written in A.D. 62 or 63. (4) 1 and 2 Timothy, Titus, the Pastoral Epistles, so called because they are addressed to two pastors and deal with matters relating to the ministry, written in A.D. 65. The so-called Epistle to the Hebrews does not claim to have been written by Paul, though ascribed to him in the Eastern and later in the Western Church, and the description Epistle is hardly correct. Its author is unknown. It seems to have been written between A.D. 75 and 85.

The rest of the N.T. Epistles are commonly known as General or Catholic Epistles, because they are apparently addressed to Christians in general. They are: James, Jude, 1 and 2 Peter, 1, 2 and 3 John. The author of the Epistle of

James may have been the brother of the Lord. Jude describes himself as "servant of Jesus Christ" and "brother of James." Peter is the famous apostle. The First Epistle of John is closely related to the Gospel of John. The Second and Third Epistles claim to be written by "the Elder."

**Epistolae Obscurorum Virorum** (Letters of Obscure Men). Series of satirical letters addressed to Ortwinus Gratius and called into existence by the Reuchlin-Dominican controversy. They played an important part in the Reformation, and have been many times reprinted. The first part, consisting of 41 letters, was published in 1515, seven more letters being added in the 3rd edition, 1516. The second part, comprising 62 fresh letters, appeared in 1517; its 2nd edition, same year, contained eight more. The two series were not published in one volume until 1556. Their authorship, long in doubt, was established by W. Brecht, who proved the principal writers of Parts 1 and 2 respectively to have been Johann Jäger, called Crotus Rubianus, and Ulrich von Hutten. *Consult* text, ed. with Eng. trans. F. G. Stokes, 1909; Die Verfasser der *Epistolae obscurorum Virorum*, W. Brecht, 1904. See Reuchlin, Johann.

**Epitaph** (Gr. *epi*, on; *taphos*, tomb or grave). Inscription on a tomb. The desire to record in lasting form the virtues or great deeds of the dead is universal, and has found expression in all ages. Some of the earliest extant epitaphs are found on Egyptian sarcophagi, and they were commonly used among the Jews. One of the most famous Greek epitaphs is that recorded by Herodotus as having been inscribed in honour of the Spartans who fell at Thermopylae: "Stranger, go tell the Lacedaemonians that we lie here obedient to their commands." Various anthologies and the catacombs of Rome supply numerous Greek and Latin examples.

Epitaphs vary infinitely in style, and reflect the literary taste of their age. In England they range from the lengthy recital of the deceased's titles and dignities in Latin and the solemn and elaborate survey of his career in the English of the eighteenth century to the severely simple and the frankly humorous. An effective Latin epitaph is that on Sir Christopher Wren in S. Paul's Cathedral, London. *Simon monumentum requiris. circumspice* (If you seek his monument, look around); while humorous epitaphs of the jesting sort frequently allude to differences between husband and

wife. Much ingenuity has been devoted to the play of words in epitaphs, e.g. in S. Benet, Paul's Wharf, London, is the following:

Here lies one More, and no more than he;  
One More and no more,—how can that be?  
Why, one More and no more may lie  
here alone;

But here lies one more, and that's more  
than one.

Unconscious humour due to carelessness or ignorance is occasionally found, as on a tombstone at Ventnor:

Here lies the body of Samuel Young, who  
came here and died for the benefit of  
his health.

Frequently, however, epitaphs of the humorous kind are not genuine, being composed as a form of literary amusement. Some of fine quality come almost under the head of epigrams. Such are most of the epitaphs in Ben Jonson's works; for instance, the lines Underneath this sable hearse, and the beautiful tribute to Elizabeth L. H.:

Would'st thou hear what man can say  
In a little? Reader, stay.  
Underneath this stone, doth lie  
As much beauty as could die;  
Which in life did harbour give  
To more virtue than doth live:  
If at all she had a fault,  
Leave it buried in this vault.  
One name was Elizabeth.  
Th'other let it sleep with death;  
Fitter, where it died to tell,  
Than that it liv'd at all Farewell.

**Epithalamium**. Nuptial song in praise of a newly wedded pair and invoking blessings on them, sung before the bridal chamber (Gr. *thalamos*). Fragments of Greek epithalamia by Anacreon, Pindar, and others have been preserved. One of the most celebrated by Latin poets is the epithalamium on Peleus and Thetis by Catullus. In English literature Spenser's *Prothalamium* and *Epithalamium* are among the most beautiful poems of this kind.

**Epithelioma**. Form of cancer in which the growth is mainly composed of cells pertaining to the epithelial or surface layer of the skin or mucous membrane. See Cancer.

**Epithelium** (Gr. *epi*, on; *thēlē*, nipple). Tissue composed almost entirely of cells with little cementing material. It forms the superficial layer of the skin and lines the internal cavities of the body. Pavement epithelium, consisting of one layer of cells fitted together like a mosaic, is found in the air-sacs of the lungs. Columnar epithelium lines the stomach and intestines. Stratified epithelium consisting of numerous layers of cells, covers the surface of the body. Ciliated epithelium is a form in which the surface of the cell carries a bunch of fine filaments having a continuous movement which sets up a current over the surface of the tissue. This form occurs in the air passages where the ciliary movement helps to clear the tissues of fine particles of foreign material and other debris.



**Epithermal Deposits.** Geological term used in the classification of ore deposits (after Lindgren). The large group of ore bodies genetically associated with igneous rock have been subdivided into several groups, according to the evidence of mineral association and geological relations. Epithermal deposits are considered to have formed from ascending thermal solutions at slight depth beneath the surface, generally at temperatures up to 200° C., pressures up to 100 atmospheres. Examples are found in the gold and silver deposits of Nevada, certain gold telluride veins, and the typical mercury deposits. Epithermal deposits frequently contain rich shoots (bonanzas) but rarely persist to great depth. It is, therefore, important for the mining engineer to know to which group his ore body belongs.

Epithermal deposits are generally associated with igneous lavas and dyke rocks, often andesite, latrite, trachyte, and rhyolite. The veins are characterised by crustification, brecciation, and open cavities. Wall rock alteration occurs, but much of the ore is confined to the vein. Short, irregular veins are the most common type. The metalliferous minerals may include those of gold, silver, mercury, base metals, tellurium, etc., while the common gangue minerals are quartz, calcite, barytes, fluorspar, adularia manganese minerals, etc.

**Epizoa.** Term for the animals which live parasitically upon, and are commonly attached to, the bodies of other animals. The term is most commonly used for those parasitic upon animals which are themselves parasitic.

**Epoch** (Gr. *epochē*, pause). In astronomy, the date on which the position of a moving celestial

object is specified. For planets and comets, the epoch usually given is that of the passage of the object through perihelion (*q.v.*). Even for the so-called fixed stars, catalogues are made for a specified epoch (e.g. 1875, 1950), so that by applying proper motion (*q.v.*) the position of any particular star can be found for any other time.

**Epode** (Gr. *epi*, on; *ōdē*, ode). Third part of the triple system of the Greek ode, which consisted of strophē, antistrophē, and epode. The term subsequently came to be loosely used in a wider significance, being applied to certain of the lyrics of Archilochus and his imitator Horace. *See* Ode.

**Eponym** (Gr. *epi*, on; *onoma*, name). Name of a real or fictitious person, the reputed founder of a country or people. Such are the mythical Brutus, from whom the name Britain is supposed to be derived, and Hellen, the traditional founder of the Hellenes or Greeks.

**Eponym Canon.** The Assyrian chronological table. The Sumerian identification of years by significant local events was simplified in Assyrian records by naming years after official personages in an orderly sequence. The word eponym is used after the analogy of the Greek archon (*q.v.*). The king was eponym in his first year, followed by his commander-in-chief, court officials, city governors, and others. Inaugurated in 1500 B.C. if not earlier, the canon hitherto recovered comprises fragmentary name-lists from Ashurbanipal's Nineveh library dated continuously from 893 to 666, and discontinuously from 911 to 640. From a supplementary list mentioning important events as well, an eclipse record was dated by astronomical calculation June 15, 763, thus fixing the whole series.

**Epping.** Market town and urban district of Essex. It stands on the summit of a hilly ridge, 382 ft. above sea level, near Epping Forest, 17 m. N.E. of London by railways and Green Line buses. The church of S. John Baptist (1832) was rebuilt in 1890 and superseded All Saints at Epping Upland as the parish church in 1889. Its tower was added in 1908. Epping has an agricultural trade. It gives its name to a division returning one member to parliament. Market day, Mon. Pop. 6,500.

**Epping Forest.** Stretch of wild woodland in Essex, England. All that remains of the old Royal Forest of Essex, known after the 13th century as the Forest of Waltham, it consists of about 6,800 acres between Leytonstone, S., and Epping, N., with Loughton, E., and Chingford, W., on high ground between the valleys of the Lea and Roding. The best of the wooded section includes Monkwood, N.W. of Loughton, and Epping Thicks, N.W. of Theydon Bois. Dark brown fallow deer run wild; a few small roe deer were introduced from Dorset in 1883. The last of the old red deer were removed to Windsor in 1827. Rabbits are numerous, and badgers, foxes, squirrels, and weasels are found.

While the pollarded hornbeam is a striking feature, there are a few aged oaks, and the beech, blackthorn, crab-apple, birch, willow, holly, and brushwood, together with gorse, broom, wild rose, and honeysuckle, lend charm and variety to the landscape. Of two ancient camps, Ambresbury Banks, 2 m. N. of Loughton, is popularly assigned to Queen Boadicea; and Loughton Camp, about 11 acres, to early British or pre-Roman origin. After protracted legal proceedings Epping Forest was secured to the public by the City Corporation and the Commons Preservation Society, at a cost of £250,000, and was opened by Queen Victoria, May 6, 1882. It is controlled by the City Corporation. A study of Epping Forest and its associations by W. Addison appeared in 1945.

**Epsom.** Market town forming with Ewell a borough of Surrey, England. It is situated 14 m. S.W. of London and is served by electric railway, bus, and Green Line. First known for its mineral springs accidentally discovered in 1618 by Henry Wicker when grazing his cattle, the town became a fashionable spa in the 17th century



**Epsom.** High Street of this Surrey market town, once a fashionable spa, but now best known for the race meetings on the adjacent downs

and was visited by royalty and London society, being especially popular about 1690. S. Martin's the parish church, has works by Flaxman and Chantrey. Epsom College is a public school, especially associated with the medical profession. Near the town is The Durdans, seat of a former Prime Minister, the 5th Earl Rosebery.

Epsom is world-famous for its race meetings held on the downs. Here the Derby, the Oaks, and other races are run and there are several large racing stables around. The town has some industries and gives its name to a division sending one member to parliament. Pop. est. 65,000.

**Epsom Salts.** Magnesium sulphate ( $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ). It crystallises in small rhombic prisms, and forms a useful saline purgative.

**Epstein, JACOB** (b. 1880). British sculptor. Born of Russo-Polish parents in New York, Nov.



Jacob Epstein  
British sculptor

10, 1880, he lived in the U.S.A. until 1902, when he went to Paris to study at the Beaux Arts. Settling in London three years later, he designed 18 figures for the British Medical Association's building in the Strand in 1908. These aroused furious controversy, and were to establish his reputation as a sculptor whose inspiration deriving from works of the past was interpreted with a new and startling vision. Influenced by Rodin, African primitive sculpture, and statues of



Epstein. Portrait head in bronze, exhibited by the sculptor at the Leicester Galleries, London, 1947



Epstein's Lucifer, an over life-size bronze figure exhibited in 1945

the earliest Egyptian dynasties, Epstein's work was attacked not only for its austerity but for its revolutionary implications. In 1909 he designed the Oscar Wilde tomb in Paris. One of his most important works, the bas relief

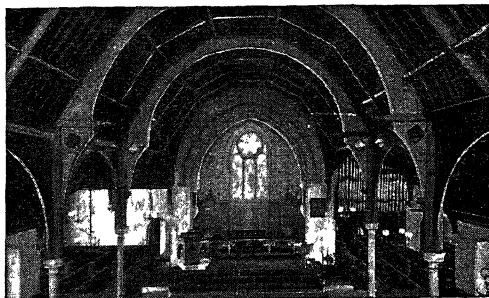
Rima, erected in Hyde Park in 1925 as part of the birdsanctuary laid out as a memorial to W. H. Hudson, the nature writer provoked a storm of criticism, due chiefly to the distortion of the human figure. It was several times defaced. His other impressive works included the colossal figure groups

of Night and Day at Broadway House, Westminster, 1928-29; Genesis, 1931; Ecce Homo, 1933; Consummation Est, 1937; Adam, 1939; Jacob and the Angel, 1942; all of which in one way or another challenged convention while they commanded respect. Apart from symbolic figures and groups, Epstein executed portrait busts in bronze, e.g. of Conrad, Rothermere, Shaw, Einstein, etc. As a painter his scenes of Epping Forest and his flower-pieces aroused interest. His work is represented in the Tate

Gallery, London, Brooklyn Museum, the Metropolitan Museum of Art, New York, etc. He wrote *The Sculptor Speaks*, 1931; *Let There be Sculpture*, 1940. See Art illus. p. 665.

**Epstein, MORTIMER** (1880-1946). British editor. Born of Jewish parents in Lithuania, he came to Great Britain as a child, and lived in Manchester. After being educated there, he studied at the Jewish theological college at Breslau, and later graduated at Heidelberg. Returning to England, he was economic adviser to several prominent commercial undertakings. In 1919 he became editor of the Statesman's Year Book, and in 1921 of the Annual Register (*q.v.*), retaining both positions until his death, June 23, 1946.

**Epworth.** Market town of Lincolnshire, England. It is on the Isle of Axholme, 9 m. N.N.W. of Gainsborough and 24 m. of Lincoln. It is famed as the birthplace



Epworth. Interior of the Wesley Memorial church built in 1889 to commemorate the birthplace of John Wesley

of John Wesley, whose father was rector here. The parish church's maple wood mazer was purchased by the British Museum, June, 1947. Pop. 1,795.

**Equaliser.** In engineering a bar which serves to equalise a pull or thrust, applied at an intermediate point equally between its two ends. See Compensating Beam.

**Equation** (Lat. *aequare*, to make equal). Statement of equality between two quantities. Thus  $19 + 6 = 25$  is an arithmetical equation. In algebra an equation is usually a statement involving known and unknown quantities,

the knowns being denoted by the earlier letters of the alphabet,  $a, b, c$ , and the unknowns by the later letters  $x, y, z$ .  $ax=b$  is a simple algebraic equation,  $x$  being the unknown quantity,  $a$  and  $b$  being supposed known. If  $a=6$  and  $b=42$  then  $x = \frac{b}{a} = \frac{42}{6} = 7$ .

Equations involving a number of unknowns,  $x, y, z$ , may form a system, and are then called simultaneous equations.

$$ax+by+cz=d$$

$$ex+fy+gz=h$$

$$kx+ly+mz=n$$

are simultaneous equations, and the problem is to find values of  $x, y$ , and  $z$  which will satisfy all three equations.

The degree of an equation is indicated by the highest power of one of its unknowns. Thus in the equation  $ax^2+by=c$  the highest power of the unknown  $x$  is 2, and the equation is said to be of the second degree. An equation which is true for any values whatever of the quantities concerned is called an identity, and the connecting symbol is usually three parallel straight lines:

$$x^2-y^2 \equiv (x-y)(x+y)$$

is an example.

There are as many solutions to an equation as the degree of the unknown. An equation of the second degree has two solutions, an equation of the third degree three, and so on. The methods of solving equations up to and including the fourth degree are well known, and it has been proved impossible to obtain the algebraic solutions of equations of a higher degree. The symbol  $\equiv$  was first used by Recorde (1510-58). See Algebra.

**CHEMICAL EQUATIONS.** The change which occurs in a chemical reaction is represented by formulae and symbols which show the distribution of the molecules of the reacting bodies before and after the change. The elements are represented by symbols and atomic weights, and the sum of the weights of the original substances equals the sum of the weights of the products of the reaction: hence the representation is termed an equation. Chemical equations merely express symbolically the verified results of the action of different molecules upon each other. Berthollet formulated the conditions as regards solutions as follows:

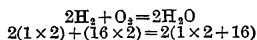
1. When two or more substances are brought together in solution, a substance will form and separate as a precipitate, if by any rearrange-

ment of the atoms a product can be formed which is insoluble in the liquid.

2. When two substances are brought together in solution, if a gaseous body or one that is volatile at the temperature of the experiment can form, it will escape as a gas or vapour.

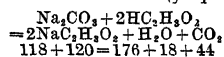
For example: When silver nitrate solution and hydrochloric acid are mixed, the insoluble silver chloride is formed as a white precipitate (1); when vinegar is added to a solution of washing soda (sodium carbonate) a brisk effervescence results from the carbon dioxide given off (2).

The equation representing the formation of water ( $H_2O$ ) from its elements (hydrogen and oxygen) is written:



This equation symbolises the formation of two molecules of water from two molecules of hydrogen and one molecule of oxygen. The numbers beneath the symbols are the parts by weight of the elements involved in the reactions. The equation, however, does not tell us the conditions of the experiment; in this case a mere mixing of the gases does not result in a reaction, it is necessary to cause them to combine by means of an electric current.

As another example, the reaction between washing soda and vinegar may be used. Washing soda is sodium carbonate ( $Na_2CO_3$ ), with ten molecules of water of crystallisation which need not be shown in the equation. The acidity of vinegar is due to the acetic acid it contains. The formula for acetic acid can be written in several ways, e.g.  $HC_2H_3O_2$ ;  $C_2H_3O_2$ ;  $CH_3COOH$ ; or  $C_2H_3.OH$ . Taking the first expression as most suitable, we obtain the following equation:



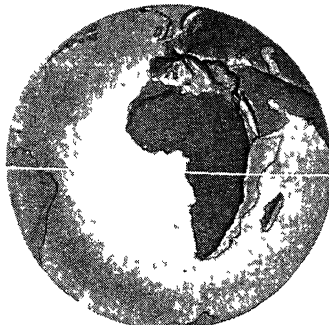
On the right hand side results are shown, sodium acetate (which remains in solution), water, and carbon dioxide. We have thus accounted for the products of the reaction in accordance with the doctrine of the indestructibility of matter. The sums of the molecular weights on both sides are equal (rounded figures have been used), showing that all the atoms are accounted for.

In astronomy, an equation is a small correction added to or subtracted from a numerical quantity to compensate for a known irregularity or error. Thus, equation of

time, or personal equation, the correction applied to allow for a habitual inaccuracy of observation by a given person.

**Equation of Time.** A solar day is the interval which elapses between two successive passages of the sun over the meridian of a given place (e.g. London). Owing to the obliquity of the ecliptic to the equator, and to the varying velocity of the earth in its orbit, this interval is not always the same. Hence solar time differs from the mean solar time, registered by a perfectly even-going clock, constructed so as to record 24 hours to a mean solar day. There will be a difference between noon as registered by a sundial and as registered by the clock, and the difference will vary from day to day. This difference is called the equation of time, and is tabulated day by day in almanacs. Its maximum value is  $16\frac{1}{2}$  mins. about Nov. 3. See Horology.

**Equator** (Lat. *aequare*, to equalise). Circle drawn round the globe midway between the N. and S. poles. At the equator the sun is seen directly overhead at noon at the equinoxes. Latitude is measured N. and S. of this circle. It is the longest line, in one plane,

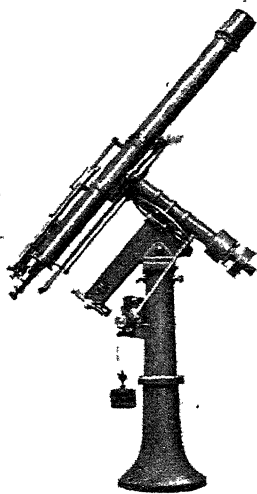


Equator. Perspective view of the earth, showing where the equator cuts Africa and a portion of S. America

that can be drawn round the earth, measuring approximately 24,902 m.

Strictly speaking, this line is the terrestrial equator. The great circle in which the plane of the terrestrial equator cuts the celestial sphere is called the celestial equator. The magnetic equator is that line drawn round the earth at any point on which the vertical components of the force of the earth's magnetism is zero. See Earth; Equinox; Latitude.

**Equatorial.** Telescope mounted and driven so as to follow the stars from rising to setting. The mounting consists of a polar axis, set



**Equatorial. Telescope mounted to enable the observer to follow the heavenly bodies across the sky**  
*By courtesy of T. Cooke & Son*

parallel to the earth's axis in bearings so arranged that it can be rotated once in 24 hours by clockwork or electric motor. At right angles to this, a declination axis carries the telescope tube itself. The tube can be rotated by hand about the two axes until the telescope points to any desired star; the drive will then exactly counteract the effect of the earth's rotation and keep the telescope pointed towards the star indefinitely whilst observations are made. All big modern telescopes are mounted equatorially. The biggest, the 200-in. reflector on Mt. Palomar, Calif., has a cradle-type polar axis with the telescope tube slung within it between two declination bearings. With a solid upper bearing such as that of the 100-in. reflector at Mt. Wilson Observatory, the telescope cannot reach the polar regions. In lighter instruments such as the 72-in. reflector at Victoria, B.C., or the 40-in. refractor at the Yerkes Observatory, the declination axis carries the telescope at one end and a counterpoise weight at the other; this doubles the weight on the bearings, but is simpler to make and use. See Observatory; Telescope.

**Equatorial Africa, FRENCH.** Territory comprising Gabun (Gabon), Middle Congo colony, Ubangi-Shari, and Chad. Adjoining on the N.W. are French Cameroons; on the S., Belgian Congo; on the E., Anglo-Egyptian Sudan; on the N., Libya. French acquisition on the Gabun river began in 1839;

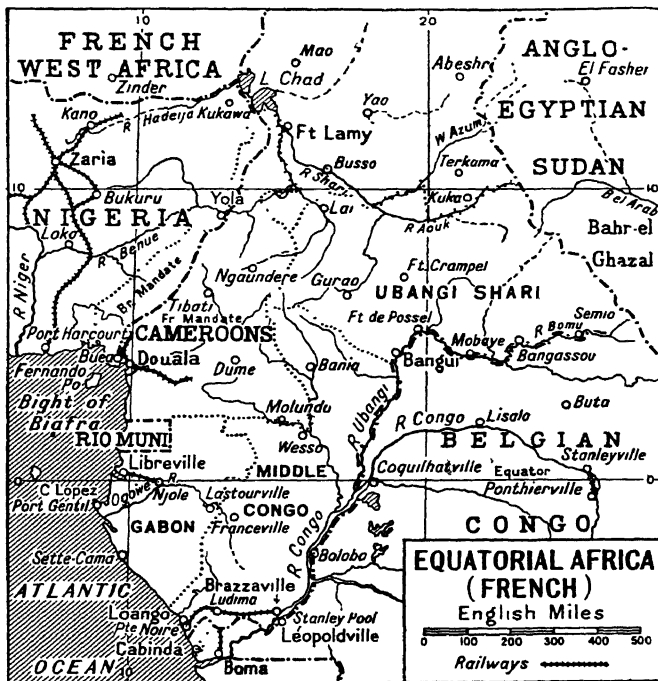
Libreville was founded in 1848, and Cape Lopez was gained in 1862. Since then the territories have been enlarged by exploration and military occupation, and their boundaries have been defined in a series of international conventions. By a decree of 1934, French Equatorial Africa was constituted a single administrative unit, the headquarters of the governor-general being at Brazzaville (*g.v.*). It was made a colony in 1941. The chief ports are Port Gentil, Libreville, and Pointe Noire. The principal products are cocoa, coffee, cotton, palm kernels, ground nuts, and timber; while copper, zinc, gold, lead, diamonds, corundum, and tantalum are found. Whale fishing is an industry. Area, 959,256 sq. m. Pop. 3,730,809.

This vast area broke with the Vichy government in Aug., 1940, during the Second Great War, and with British West and East Africa formed a block of Allied territory stretching across the continent and providing a vital life-line from Great Britain and the U.S.A. to the Middle East at a time when the Mediterranean was closed to the Allies. Roads were constructed, linking the Atlantic coast ports with Egypt and the Sudan and air bases were built across the territory, making it possible for air-

craft to be ferried across Africa to the operational areas. The opening of the trans-Sahara road in May, 1943, linked French N. Africa with Chad. See Camerouns; Chad; Gabun; Ubangi Shari. *Consult* Exploration and Adventure in Equatorial Africa, P. B. du Chaillu, new ed. 1945.

**Equerry.** Originally an official of the royal stables. In the British royal household the equerries are army officers in the department of the master of the horse. The chief or crown equerry is a permanent official, who looks after the stables and stud. The sovereign always has an equerry in attendance. The form of the word, originally meaning stable (Fr. *écurie*, late Lat. *scuria*), has been influenced in English by a supposed connexion with Lat. *equus* (horse).

**Equidae** (Lat. *equus*, horse). Family of ungulate mammals, including the horses, asses, and zebras. In geological history, the horse family can be traced back to ancestors that had five toes instead of the single toe of modern horses. Phenacodus, a five-toed animal about the size of a bull-dog, lived at the beginning of the tertiary period. The next stage is seen in Hyracotherium, which was about the size of a fox, with four equal toes on the fore limbs, found in



**Equatorial Africa, French. Map of territories which in 1934 were constituted a single administrative unit, and in 1941 were made a colony**

lower Eocene strata. Succeeding stages are represented by Anchi-therium, with three toes and a diminutive fourth, in the Miocene age in Europe; Hipparion, with one large middle toe and two smaller side toes, in the Pliocene age; and Equus, two diminutive toes on each side of the large toe, in the Pliocene age. See Horse.

**Equilibrium** (Lat. *aequus*, equal; *libra*, balance). In a system of forces a state of equilibrium exists when the forces under consideration are so arranged that they balance or have no resultant at any point. A body is in stable equilibrium when it returns to its original position after being disturbed; in unstable equilibrium when it continues to move in the direction given to it by a disturbing force.

**CHEMICAL EQUILIBRIUM.** This is a balanced action between chemicals similar to that indicated by equilibrium in mechanics. It most closely resembles the mechanical equilibrium established when friction is large or inertia small, because in a chemical system there is nothing corresponding to the oscillations in mechanics. See Dynamics; Motion.

**Equilibrium Diagram.** This device of metallurgists is explained under Constitution Diagram.

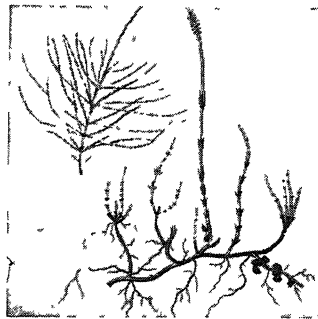
**Equinoctial Gales** (Lat. *aequus*, equal; *nox*, night). Term indicating a belief that gales normally occur about the equinoxes. (*v. s.*). Actually, in N. America and Europe and over the N. Atlantic Ocean, winter is the period of most frequent and most intense gales.

**Equinox.** Dates on which the day and night are of equal length, and the length of day is the same for all parts of the world. Twice a year—at the vernal equinox, March 21, and at the autumnal equinox, Sept. 23—all places on the earth experience a day and a night each twelve hours long, the sun is vertically over points on the earth's equator, and it rises due E. and sets due W. everywhere.

The plane of the earth's equator infinitely produced cuts the celestial sphere in a fixed great circle which is called the celestial equator. At the points where the plane of the ediptic (*q. v.*) cuts the plane of the equator, or, more precisely, when the earth in its annual path is at these points, it will be so placed with regard to the sun that all over the earth day and night will be equal in length.

**Equisetaceae** (Lat. *aequus*, horse; *seta*, bristle). Small family of Pteridophytes. It consists of

the single genus *Equisetum*—the horsetails. They are mostly natives of the N. temperate regions, but a few are sub-tropical. They have creeping rootstocks from which arise the erect, hollow, jointed stems, which are round and finely grooved. They are solid at the joints, which have toothed sheaths into which the next joint fits and from which the branches are given



Equisetaceae. Fertile and barren stems of the horsetail

off in whorls. The spores are produced on the undersides of scales of a terminal oval cone. *E. martii*, a native of Brazil, attains a height of 30 ft., but the other species are only a few feet high. The stems are covered with silica, and those of *E. hyemale* constitute the Dutch rushes of commerce, used for scouring and polishing.

**Equitable.** British life assurance company, in full the Equitable Life Assurance Society. Founded in 1762 as the Society for Equitable Assurance in Life and Survivorship, it is one of the oldest of the kind. In 1892 it was registered as a company. It is what is known as a mutual office, *i. e.* it has no shareholders, all profits after the payment of expenses going to policy holders. It has a controlling interest in the University Life Assurance Society and the Reversionary Interest Society. The head office is 19, Coleman Street, London, E.C.2

**Equitable Charge.** In English law, a charge on property which formerly was not enforced by a court of common law, but only by the court of chancery. Wherever the chancery court found an intention in a document that a sum of money should be secured on property, or paid out of it, the court would enforce it as a charge. For instance, if A owes B money, and gives B a letter saying "I will pay you out of the money due to me by C," this is a charge on C's debt, and the court will restrain C from paying the debt to A with-

out satisfying B's claim. Today all courts recognize and enforce equitable charges.

**Equitable Estate.** In English law the legal ownership of property may be vested in one person, and the equitable ownership in another. Thus a trustee is the legal owner of the trust property, but the beneficiaries have the equitable estate.

**Equites** (Lat., horsemen). In ancient Rome, originally citizens wealthy enough to support the expense of serving as horse soldiers. With lapse of time, as the citizen militia gave way to a paid army, the *equites*, conventionally translated knights, became merely a class in the state possessed of a certain amount of wealth, ranking below the senatorial order, but above the common people. As senators were forbidden to engage in trade, this equestrian order tended to be composed largely of merchants and other tradesmen.

The farming of taxes was an equestrian privilege, and at one time jrymen were exclusively drawn from the ranks of the knights. Under Augustus the order became more sharply defined; certain posts in the state service were reserved for them, the most important being the governorship of Egypt, the commissionership of corn supply, and the command of the fleet. The originally military associations of the equites survived only in state ceremonies. *Pron. ek-wit-eez.*

**Equity** (Lat. *aequitas*). Term used by English lawyers to describe that part of the law of England formerly enforced only by the court of chancery, and not by the common law courts. Equity was of two kinds: (1) where the court of chancery gave rights which the common law courts did not give; and (2) where chancery gave remedies which the common law knew nothing about.

Equitable rights unknown to the common law were numerous. The common law knew nothing of trusts and trustees. If a man had property conveyed to him, he was the legal owner, but if the property had been conveyed to him to be applied for the benefit of another, the chancellor would enforce the trust. The chancellor's jurisdiction was said to be founded on conscience. Gradually, side by side with the common law and sometimes conflicting with it, a great system of equity or chancery law grew up. When rights at common law and rights in equity did so conflict, the chancery court would grant an injunction to restrain the defendant

from exercising his legal rights—that is, from bringing or going on with a common law action to enforce those rights. Since the Judicature Act, 1873, all courts administer common law and equity side by side, so that such injunctions are now unnecessary.

Equitable remedies unknown to the common law were invented by the chancellors. The chief were the injunction and specific performance. The latter compels a man to carry out the contract he has made, and does not allow him to break it and pay damages. This jurisdiction was founded on the inadequacy of the remedy at common law, whose one and only panacea for every wrong and every breach of contract was damages. On the same principle the chancellor would grant an injunction to restrain a breach of contract, or the continuance of a wrong, or the commission of a threatened wrong, where damages would be an inadequate remedy. Thus, if I had a right of way over a footpath across A's field, and A stopped up the path, at common law I would get damages; but in equity I would have an injunction to restrain A from continuing to obstruct the path; and if A disobeyed, he would be attached. Equity, however, would not grant specific performance of every contract, or grant an injunction to prevent every wrong; but only when the remedy in damages was inadequate.

At common law there was no discovery, and, until comparatively recently, neither plaintiff nor defendant, nor anyone privy to them in blood or estate, was allowed to give evidence. This did not apply in the chancery court. So a common law plaintiff or defendant used to "file a bill" for discovery. That is, he made the other side answer on oath as to what documents he had in his possession. Also he could ask a long string of questions about the common law action, and compel the other side to answer them in writing and on oath. This procedure is now obsolete, as all courts, even county courts, have power to order discovery and interrogatories.

The principal subjects of the equitable jurisdiction are the enforcement and administration of trusts, the winding-up of partnerships; the administration of deceased persons' estates; the guardianship and property of infants; injunctions; the specific performance of contracts; the taking of accounts; the rectifica-

tion, setting aside, or cancellation of deeds or other written instruments, on the ground of mistake, misrepresentation, fraud, or undue influence; and the partition or sale of real estates.

At one time a court of equity could not award damages. They were reserved for the courts of common law. By the Judicature Act, 1873, however, all branches of the high court can now award damages in proper cases; though it is still unusual to bring an action for damages alone in the chancery division. *See Jurisprudence; Law.*

**Equity.** British actors' association. Founded 1930, and administered by a council elected annually, this organization promotes and protects the art of the theatre in all its branches and regulates the relations between actors and managers, agents, etc. Yearly fee £2 2s. The association has greatly improved the conditions prevailing in all branches of entertainment. By the end of 1943 the membership was approximately 5,500.

**Equuleus** (Lat., young horse). One of the Ptolemaic constellations. It is a small group of stars close by the head of Pegasus, so placed as to suggest that another horse is galloping by Pegasus.

**Era** or **AERA**. In chronology, a fixed point of time from which years and historical events are reckoned. Generally the date of some decisive occurrence in the history of the world, or of a particular people or individual, it also denotes the series of years reckoned therefrom. Important eras are: the Jewish, from 3761 B.C.; the Greek Olympiads, from 776 B.C.; the Roman, from 753 B.C., the traditional date of the foundation of Rome; the Babylonian, that of Nabonassar, 747 B.C.; the Spanish from 38 B.C., the conquest of Spain by Augustus; the Christian; the Mahomedan, 622. *See Chronology.*



Erased in heraldry

**Erased.** In heraldry, a charge, such as a head, a limb, a branch of a tree, shown with a jagged end. But a branch shown as torn off is generally said to be slipped if small, or snagged if large.

**Erasmus, DESIDERIUS** (1466–1536). Dutch humanist. He was probably born at Rotterdam, Oct. 28, 1466, the illegitimate son of Gerard de Praet of Gouda. For the name Gerard, meaning well-beloved, he afterwards substituted

the incorrect Latin and Greek equivalents, Desiderius Erasmus. After four years' schooling at Deventer, he was sent by his guardians to a seminary of the Brothers of the Common Life at Hertogenbosch (Bois-le-duc), and in 1486



After F. Penn in the Royal Collection at Windsor

entered the cloister of Stein and took the vows of the Augustinian order. In 1491 he became secretary to the bishop of Cambrai and a priest in 1492. After spending some time at the Collège Montaigu in Paris, he returned to Cambrai, but resumed his studies in Paris in 1496. At the same time he took pupils, one of whom, Lord Mountjoy, invited him to England.

Residing chiefly at Oxford, he became the friend of Thomas More and Colet, and received instruction in Greek from Groeyn and Linaere. He re-visited England in 1506 and 1509, the last time at the invitation of Fisher, bishop of Rochester and chancellor of Cambridge university. He taught Greek in Cambridge, and was appointed Lady Margaret professor of divinity. Between his visits to England and for some time afterwards he led a wandering life. During 1521–29 he was at Basel, where most of his works were published, and during 1529–35 at Freiburg, whence he returned to Basel and died July 12, 1536.

Of his editions of classical works the most important is Terence, 1532. *Adagia*, 1500, and *Apophthegmata*, 1531, contain maxims and anecdotes from classical authors, accompanied by moral reflections; *Ciceronianus*, 1528, is an attack upon the Italian school of Latin prose writers, who refused to admit any words or phrases not found in Cicero. He edited many of the Fathers of the Church, but his greatest service to



theology was his edition of the New Testament, 1516, the Greek text with a Latin translation, his treatment of which entitles him to be called the pioneer of Biblical criticism. The *Enchiridion Militis Christiani* (Dagger or Manual of the Christian soldier), 1502, is an attack on the inefficacy of formal religion. Other famous treatises are *Encomium Moriae* (Praise of Folly), 1509, a satire on clerical abuses and human follies, and *Colloquia*, 1516, specially a castigation of the vices of priests and others. Much of his correspondence throws light on the manners and customs of the England of his day.

Erasmus has been much criticised for the part he played in the Reformation and his attitude towards Luther. "Erasmus laid the egg and Luther hatched it," it was said. The truth is that Erasmus was a scholar, not a theologian; he was not the stuff of which religious zealots or martyrs are made. To use his own words, "I am afraid if I were put to the trial, I should imitate St. Peter." While conscious of the faults of Roman Catholicism, he always remained a Catholic, and while acknowledging the need of religious reform, he clearly saw the dangers that would inevitably follow extremist efforts in that direction. See Humanists: Renaissance.

**Bibliography.** Collected Works, ed. J. Clericus (Le Clerc), 10 vols., Leyden, 1703-06. Lives, by R. B. Drummond, 1873, R. C. Jebb, 1890, F. H. Capey, 1902; C. Hollis, 1933; S. Zweig, 1934; The Epistles of E. (to his 51st year), Eng. trans., F. M. Nichols, 1901-04; Opus Epistolarum Erasmi, ed. P. S. Allen, 1906; The Age of Erasmus, P. S. Allen, 1914.

**Erastianism.** Term specially applied to the view of Church policy which regarded the Church as mainly or solely a department of the State. Its upholders urged that while the choice and practice of religion was a matter for the individual conscience, the external organization of churches—including the appointment of ministers—was a function of the State. In a general sense, Erastianism means the doctrines of Thomas Erastus.

**Erastus**, THOMAS (1524-83). Swiss theologian. His family name was Lieber or Liebler, of which Erastus (beloved) is the Greek form. Born Sept. 7, 1524, at Baden, Switzerland, of peasant origin, he studied theology at Basel, and medicine and philosophy at Padua. In 1558 he became professor of medicine at Heidelberg, and later of ethics at Basel, where he died Dec. 31, 1583. A strong opponent of Calvinism, he upheld the Zwinglian doctrine. In a post-

humous work he maintained that offences of Christians should be punished by the civil power rather than the ecclesiastical. Consult Theses of Erastus touching Excommunication, Eng. trans. R. Lee, 1844. See Erastianism.

**Erasur** (Lat. *e*, out; *radere*, to scratch). Word meaning an obliteration, used mainly in connexion with written documents. In a legal document an erasure may be fatal to its validity, unless it can be proved that it was made before the document was executed. The parties concerned should initial the place where the erasure is made.

**- Eratosthenes** (c. 284-204 B.C.). Greek geographer, mathematician, astronomer, critic, and poet. Born at Cyrēnē, he studied at Alexandria and then at Athens, whence he was summoned in 235 by Ptolemy Euergetēs to take charge of the library at Alexandria, a post which he held until his death. His chief work, *Geographica*, was a treatise on physical, mathematical (based on his method of measuring the earth), and political geography. His mathematical works included a treatise *On Means*; the *Kosmion* (sieve) was a mechanical device for finding prime numbers. He also wrote an astronomical poem, *Hermes*, a description of the heavens and the mythological legends associated with the stars; a *Chronographia* or *Annals*; a valuable list of the victors in the Olympic games; and a history of old comedy.

**Erbium.** Metallic element of the rare earth erbia, which is its oxide. Its atomic weight has been determined as 167.7, and its specific gravity as 4.77, but while pure compounds have been prepared, the element has not yet been isolated. The oxide was first recognized in 1843. With dysprosium, holmium, and thulium it forms the erbia sub-group of rare earths, all of which are included in the yttrium group. Erbium is found in almost all the rare earths, but is most conveniently extracted from zenotime, fergusonite, euxenite, polychrase, and blomstrandin.

**Ercilla y Zúñiga**, ALONSO DE (1533-95). Spanish poet. He was a native of Madrid, and became attendant to Philip II, whom he accompanied to England in 1554. Ercilla fought in Chile against the Araucanians. The closing years of his life were lived in poverty and

neglect. His poems are mainly heroic, notably *La Araucana*, which embodied his war experiences.

**Eckmann-Chatrian.** Compound signature of two successful literary partners and collaborators. They were Émile Eckmann, born

May 20, 1822, at Phalsbourg, and Alexandre Chatrian, born Dec. 18, 1826, at Soldaten-thal, both in Lorraine. They began to collaborate in 1848, but first won success in 1859 with *L'illustre Docteur Mathéus*. In 1862 they began, with *L'invasion: ou le tou Yégoï*, a series of novels which included *Histoire d'un Conscrit* and *Waterloo*, which remain among the best war stories ever written. Industrious playwrights, also in collaboration, they wrote *Le Juif Polonais* (Théâtre Cluny, June, 1869), fami-

Alexandre Chatrian,  
French author

liar in English to all playgoers as *The Bells*. Another of their plays, *L'ami Fritz*, 1876, retains its popularity in various modified forms. The collaboration was terminated by a difference of



Émile Eckmann,  
French author

opinion on money matters. Chatrian died in Paris, Sept. 4, 1890. Eckmann died at Lunéville, March 13, 1899.

**Ercole da Ferrara** (c. 1462-1531). Italian painter. Born at Ferrara, little is known of him

except that he was in the service of the Duke of Ferrara from 1492-99, and died in Ferrara in 1531. Among his best works, distinguished by the warmth of their colouring, are *The Madonna and Child*, and *Conversion of St. Paul* in the National Gallery, London. His real name appears to have been Ercole di Giulio Grandi, and his pictures have often been confounded with those of his fellow-townsmen and contemporary, Ercole di Roberti Grandi (c. 1455-96), probably his brother. The latter



Ercole da Ferrara,  
Italian painter  
From an old engraving



Alonso de Ercilla  
y Zúñiga,  
Spanish poet



Mt. Erebus. Sir Ernest Shackleton's camp 7,000 ft. up this Antarctic Volcano. The steam from the active crater is visible on the mountain top

By courtesy of Wm. Heinemann

was obviously influenced by Mantegna in his earlier work at Bologna: his second style, adopted after he settled in Ferrara in 1486, was more suave and graceful.

**Erebus** (Gr. *erebos*, darkness). In Greek mythology, son of Chaos and father of Hemera (Day) by union with his sister Nyx (Night). The word is sometimes used as equivalent to the lower world generally, sometimes for the region through which souls' passed on their way to Hades proper.

**Erebus**. Volcano of Ross Island, off S. Victoria Land, Antarctica, in lat.  $77^{\circ} 30' S$ . It has an alt. of 13,000 ft. Another volcanic peak, Mt. Terror (alt. 10,900 ft.), lies 30 m. farther E. They were discovered by Captain James Ross in 1841, who named them after his ships. Erebus has been active in recent times but Terror is dormant or extinct.

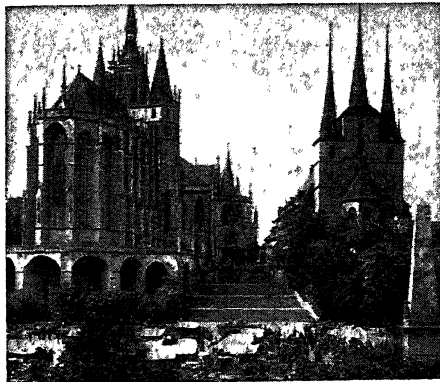
**Erech**. Biblical name of the Sumerian city Uruk. Its site is occupied by the modern village of Warka on the left Euphrates bank between Samawa and Shatra, 138 m. S.S.E. of Bagdad, and its extensive ruins attest its former greatness. Mentioned in Gen. 10, the hegemony established by Lugalzaggisi (c. 2825 B.C.) was finally secured by Ur about 2450. Ashurbanipal deported to Samaria some of the inhabitants of Erech, the Archevites of Ezra 4. Loftus's excavations, 1854, revealed the temple and tower of its city-goddess Nana. Further excavations in 1913 brought to light relics of the Assyrian and Seleucid period.

**Erechtheum** (Gr. *Erechtheion*). Ionic temple on the Acropolis, Athens (q.v.), just N.W. of the Parthenon. It was built partly in honour of the Greek hero, Erechtheus, and contained the shrine and a sacred wooden image of Athena Polias, guardian of the city,

and the tomb of Cecrops, beside other treasures. A unique and beautiful structure, much of which is still standing, it is noted for its remarkable porch of the Caryatides (q.v.), six draped female figures supporting the roof. The original building was destroyed by the Persians in 480 B.C.; the new, begun about 437 or later, was much damaged by fire in 406, and was unfinished in 395. See Athens.

**Erechtheus** or ERICHTHONTIS. In Greek mythology, legendary king of Athens. He was said to have been the founder of the great Athenian festival of the Panathenaea, and to have introduced the worship of Athena.

**Eregli**. Name of three Turkish towns, two in Asiatic Turkey and one in Thrace. (1) Port on the Black Sea, between the Bosphorus and Sinope, in Zonguldak vilayet. This was the ancient Heracleia, whence Xenophon's 10,000 Greeks set out on their return to Greece by sea. Sometimes called Banderegh, it is a busy place, with some ship-building and an export trade in silks, cattle, and coal. (2) Town in Konya vilayet, the ancient Cybistra. It stands on the Bagdad rly., halfway between Konya and Adana. There are remarkable Hittite remains in the neighbourhood. (3) Town of Thrace, on the European side of the Sea of Marmara, about 50 m. W.S.W. of Istanbul. It is also known as Eski Eregli and was the ancient Perinthus.



Erfurt. Left, Gothic cathedral church of Our Lady; right, the 15th century church of S. Severus

**Eremurus**. Genus of perennial herbs of the family Liliaceae. Natives of Asia, from S. Russia to Hindustan, they have fascicled roots, long slender leaves, and leafless flower stems terminating in a long spray of yellow, rosy, or white flowers, much like the hyacinth.

**Eretria**. Ancient city of Greece, on the W. coast of Euboea. It stood on the Euripus, 14 m. S.E. of Chalcis. It sided in 498 B.C. with the Greeks of Asia Minor against the Persians, who destroyed it eight years later. Rebuilt by the Athenians, it was the seat of a short-lived school of philosophy founded by Menedemus, whose tenets were akin to those of the Megarians. Eretria figured prominently in the war between Athens and Philip of Macedon. Recent excavations have revealed the remains of a theatre, an early temple, and other relics of the pre-Persian period. The site is now occupied by the swamp-bound town of Nea-Psara.

**Erewhon** OR OVER THE RANGE. Satire by Samuel Butler. One of the outstanding satires in English literature, this most popular of Butler's books was published 1872. When sheep farming in New Zealand, Butler wrote a sketch, Darwin Among the Machines (1863), and in this may be traced the germ of the imaginary country he depicts with such masterly incisiveness in the novel. In the manners and customs of Erewhon (nearly a reversed spelling of Nowhere), Butler satirised those of his own age; by placing the scenes and characters beyond time, he was able to draw a parallel with those of Victorian Britain. A sequel, Erewhon Revisited, notable for its humour, was published 1901.

**Erfurt**. A city of Germany. Largest town and chief economic centre of Thuringia, it stands 14 m. W. of Weimar, in the valley of the Gera, at the junction of many railways. Before the Second Great War its ancient buildings attracted tourists; the cathedral, dedicated to the Virgin Mary, mainly built in the 13th century, surrounded by towers of the old town, was one of the finest survivals of medieval architecture in Germany. There were 14 R.C. and 11 Protestant churches; the cathedral and neigh-

bouring church of S. Severus remained R.C. The former Augustine monastery where Luther lived, 1505-08, was turned into an orphanage, called in his honour Martinstift. The Predicants', Barefooted, and Augustine Friars' churches, now Protestant, date from the 13th and 14th centuries; and the university where Luther studied was built in 1392. The museum (1706) housed a unique collection of medieval art. Fortified until 1873, Erfurt's twin citadels dominated the city, the foundation of which dates from the pre-Charlemagne period, being made the seat of a bishopric by S. Boniface in 741.

Erfurt became an industrial centre early in the 19th century; it was famous for machinery, shoes, furniture, and rolling stock. Textile and chemical plants were developed; brewing and dyeing flourished, as did the flower seed trade. The former university influenced the whole of Germany from 1378 to 1806. Pop. (pre-war), 166,661.

During its early history Erfurt, though under the archbishop of Mainz, pursued an independent policy. The town council supported emperors in conflict with the Church, yet it never gained the status of a free city. From 1483 it came under the protection, then under the domination, of the Saxon dynasty. During the Thirty Years' War it became a Swedish stronghold, but in 1664 was recaptured by a Mainz archbishop. Ceded to Prussia in 1802, it was occupied in 1806 by Napoleon, who had met Tsar Alexander I there during the congress of 1800. Falling to Prussia in 1814, it was the scene in 1850 of the parliament of the short-lived N. German federation. During the Second Great War, the Germans made it a strong-point, and in its capture by the U.S. 3rd army it was largely destroyed. The Americans surrounded it April 11, 1945, but were counter-attacked four times. Next day, after a three-hour artillery bombardment and attacks by fighter bombers, the U.S. 80th div. launched an assault and cleared the city.

**Erg.** Unit of work; the work done when a body acted on by a force of one dyne moves one centimetre parallel to the line of action of the force. It is approximately the work done when a milligramme is raised through one centimetre. See Dyne.

**Ergometrine** or **ERGONOVINE**. One of the most important alkaloids of ergot. Isolated in 1935 by Dudley and Chassar Moir after the

latter had previously proved the existence in ergot of an unknown alkaloid, ergometrine ( $C_{19}H_{22}O_3N_3$ ) is readily soluble in water; this accounts for the activity of watery extracts of ergot. In medicine, a dose is  $\frac{1}{160}$  to  $\frac{1}{40}$  grain; by intramuscular injection,  $\frac{1}{160}$  to  $\frac{1}{40}$  grain; by intravenous injection,  $\frac{1}{160}$  to  $\frac{1}{40}$  grain. Its specific action is to initiate a long persistent rhythm of powerful contractions in a uterus normally quiescent. Clinically, ergometrine is remarkable for its rapidity of action; its greatest value is in the treatment of post-partum haemorrhage; in the control of excessive menstrual loss; and in the relief of migraine.

**Ergot** (Fr., spur). Fungoid pest (*Claviceps purpurea*) that attacks the flowers of cereals—especially rye—cultivated grasses, such as rye-grass and Timothy grass, and wild grasses. What should have been a grain is replaced by a hard spur-like outgrowth (ergot), which, if devoured by pregnant stock, may cause abortion. Ergots should not be sown with grain or grass seeds, and wild grasses infested by them should be destroyed.

The most important active principles of ergot are ergometrine (*v.s.*) and ergotoxine, which cause powerful contractions of the uterus. For this reason ergot or its preparations are sometimes administered after labour to ensure efficient contraction of the uterus and diminish the risk of post-partum haemorrhage. (Pituitary extract is more often used.) This property of ergot formerly led to its use to induce labour when desirable on medical grounds, but its action in this respect is uncertain.

Poisoning by ergot may be acute or chronic. Acute poisoning, which may result from taking a single large dose, gives rise to giddiness, vomiting, colic pains in the abdomen, disturbance of vision, cramps, muscular weakness, coma or delirium, and convulsions. Fatal cases are rare, but if the poisoning is associated with premature expulsion of the uterine contents the risk is much greater. Chronic poisoning is generally the result of eating, for a considerable period, bread which has been made from rye or other cereals infected with the fungus. Ergotism, as the condition is called, is not uncommon in Russia. The early symptoms are those of irritant poisoning: vomiting, diarrhoea, and pain in the abdomen. The latter symptoms present two types, the nervous and the gangrenous form. In the for-

mer there may be tingling sensations in the skin, spasms, and painful cramps in the muscles. Generalised convulsions resembling those of epilepsy may occur. Paralysis and affections of the mind, such as delirium, melancholia, or dementia, are other manifestations. The gangrenous form may lead to mortification of the fingers and toes. Both sets of symptoms may be present in one individual.

**Eric**, or **LITTLE BY LITTLE**. Story for boys by Dean F. W. Farrar, first published in 1858, the author being aged 27. This record of the conflicts and tribulations of Eric Williams at Roslyn School stresses with some force and passion the temptations of life and the retribution that may overtake any who succumb to them. The book ran through 36 editions during Farrar's lifetime. Though ill-attuned to later tastes in juvenile fiction, it remains a classic often quoted, if only in mockery.

**Eric XIV** (1533-77). King of Sweden, 1561-68. Born Dec. 13, 1533, he was the son and unworthy successor of Gustavus Vasa. His short reign was marked by the limiting of the power of the royal dukes and by the securing of Estonia, which began Sweden's policy of overseas expansion. His insanity and cruelty cut short his reign, for after the murder of the Stores in 1567 the nobles rose and deposed him (1568). At different times he contemplated marriage with Elizabeth of England, Mary of Scotland, Christina of Hesse, and Renée of Lorraine, but finally contented himself with marrying his mistress, Katrina Månsdotter, a peasant. He is believed to have been poisoned in Feb., 1577, at the order of his brother and successor, John.

**ERIC THE RED** (*f. c.* 985). Norse voyager. From Iceland he explored the W. coast of Greenland, 982-985, and founded a colony there the next year. He named the country Greenland to attract settlers and called his village Brattahlid. The father of Leif Ericsson (*q.v.*), he was the hero of Eric the Red's Saga.

**Ericaceae** (Gr. *erikē*, heath). Large family of evergreen shrubs, under-shrubs, and a few small trees. They are natives of temperate and cold climates. Have simple leaves, and regular flowers, some, *e.g.* the heaths (*Erica*), bell-shaped or tubular, others expanded, *e.g.* rhododendron.

**Ericht**. Loch on the borders of Perthshire and Inverness-shire, Scotland. Lying in desolate country 1,152 ft. above sea level, it is

14½ m. long and has a maximum depth of 513 ft. Overlooking the W. shore is Ben Alder (3,757 ft.). Here is a cavern in which Charles Edward sought refuge after the battle of Culloden. See Grampian Hydro-electric Scheme.

**Ericsson, JOHN** (1803-89). A Swedish-American engineer. Born July 31, 1803,



John Ericsson,  
engineer

in Vermeland, Sweden, he developed great aptitude for mechanics, and in 1820 became an engineer in the Swedish army. Seeking a wider scope for his talents, he came to England and occupied himself with improvements in steam machinery. In 1829 he built, with John Braithwaite (*q.v.*), the motive engine to Stephenson's Rocket. Ericsson was occupied with various inventions, chiefly marine engines, up to 1836, when he brought out a marine screw propeller.

Not obtaining the recognition he expected from the British Admiralty, in 1839 he went to America, where he lived for the remainder of his life. Turning his attention to defensive armour for warships and improvements in marine engines, he gained a wide reputation. In 1861 he designed the famous armoured turret ship Monitor for the American navy. He died in New York, March 8, 1889.

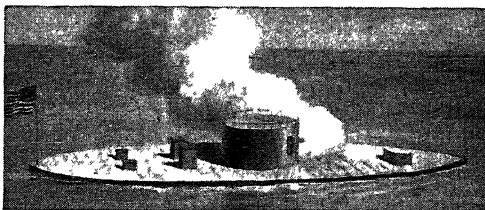
**Ericsson, LEIF** (*fl. c.* 1000). Norse voyager who discovered N. America, 1000. Son of Eric the Red, he was ordered in 999 by Olaf Tryggvason, king of Norway, to proclaim Christianity in Greenland. Driven off his course, he sighted and landed on "Vinland," probably Nova Scotia.

**Eridanus.** One of the Ptolemaic constellations. The larger part is below the S. horizon to an observer in N. Europe. The constellation is also called the River.

**Eridge Castle.** Seat of the marquess of Abergavenny in Sussex, near the Kentish border, 3 m. S. of Tunbridge Wells. The estate has belonged to the Nevilles since the 13th century, but the present castle is 19th century. The park covers

2,000 acres. At Eridge Green are the denuded sandstone Eridge Rocks. The village has a railway station, and the place gives its name to the Eridge Hunt.

**Eridu.** Sumerian settlement at Abu Shahrain, S. of Muqayyar (Moghair or Ur), S. Babylonia. Originally an islet on a Persian Gulf estuary, sacred to the water-god Ea, it was the traditional cradleland of some aspects of Babylonian religion. Examined by J. E. Taylor, 1854, its sandstone wall, 20 ft. high, enclosed a platform with marble staircase, bearing a two-staged brick tower. Excavations by Thompson, 1918, and Hall, 1919, revealed a pre-Sumerian neolithic substratum and further excavations by the Iraq government, 1947, disclosed deeper lateral extensions of the platform, with a temple (4000 B.C.) beneath the tower, remains of still earlier temples, and much fine pottery. See Iraq illus.



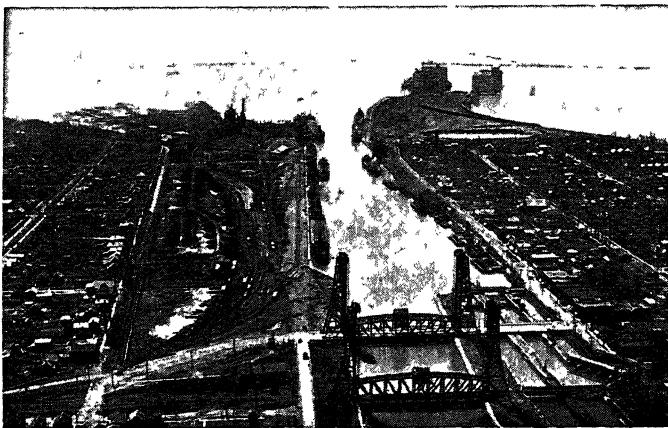
Ericsson. The Monitor, an ironclad turret ship, built from Ericsson's plans by the Federal navy during the American Civil War

**Erie.** Southernmost of the chain of great lakes in N. America. It forms part of the boundary between the U.S.A. and Canada. Area, 10,000 sq. m. It is 250 m. long, and its greatest breadth is 60 m., while its average depth is 90 ft. The lake is 565 ft. above the

level of tide water in the Hudson river at Albany, and 330 ft. above the level of Lake Ontario, into which it discharges its waters by the Falls of Niagara. At its N.W. end it receives the surplus waters of lakes Superior, Michigan, and Huron, through the river Detroit. Contributory feeders are the rivers Thames and Grand. A large number of steamers and other ships traverse it, except in winter, when it is generally frozen for a considerable period. In very hard winters it is possible to cross from the U.S.A. to Canada over the ice.

Lake Erie is the outlet of a large system of connecting canals, which render its navigation of great importance. The Welland Canal connects with Lake Ontario; the Erie Canal affords communication between Buffalo and Albany, thus linking up with the Hudson river; the Ohio Canal begins at Cleveland and ends at Portsmouth, on the Ohio river; and the Miami and Erie Canal connects Toledo with Cincinnati. During the war of 1812-15 an American squadron, under Commodore Perry, captured here a British force of six vessels on Sept. 10, 1813.

**Erie.** City of Pennsylvania, U.S.A., the co. seat of Erie co. On Lake Erie, 88 m. S.W. of Buffalo. It is served by rlys. and an airport. The largest land-locked harbour on Lake Erie, with artificial improvements, it is protected by Presque Isle, a strip of land 6 m. long and 1 m. in extreme breadth, and has a maximum depth of 25 ft. An industrial and commercial centre with a valuable trade by lake and rly. in coal, iron, grain, and agricultural produce, Erie is said to ship more fresh-water fish than any other



Erie. Port Colborne, Ontario, on Lake Erie. The lake, which forms part of the boundary between Canada and the U.S.A., is connected by the Welland Canal with Lake Ontario. It is an important shipping waterway

port in the world. It leads in U.S. production of engines and boilers and also makes locomotives, stoves, pumps, furniture, wood-work, leather, and paper. The federal building and city hall are prominent. Founded on the site of the old French fort of Presque Isle, erected 1753, Erie has a city charter dating from 1851. In 1915 the city was inundated by a cloud-burst. Pop. 116,955.

**Erie Canal.** The largest artificial waterway in the U.S.A. Extending across New York state from Buffalo to Troy, it communicates between the Hudson river and Lake Erie. Begun in 1816 as a pioneer U.S. engineering feat, and completed in 1825, it was originally 363 m. long from Buffalo to Albany. The canal, which made possible the all-water transport of Pennsylvania's coal, iron, and petroleum and the Middle West's agricultural produce to the Atlantic, was responsible for the rise to commercial supremacy of the state and port of New York. Today petroleum products constitute the bulk of goods transported. The canal gives passage to vessels of 2,000-3,000 tons. It is 340 m. long, 150 ft. wide, 12 ft. deep, and has 34 locks. For five months in the year ice obstructs navigation.

**Erigena**, JOHANNES SCOTUS (c. 810-877). Scottish philosopher and theologian. He was a Scot born in Ireland, at the time called Greater Scotland, and his name *Erigena* means Irish-born. Summoned by Charles the Bald to Paris, he became teacher at the court school. *Erigena* attempted to combine the neo-Platonist theory of emanation with the Christian idea of the Creation and the doctrine of the Trinity, the result being a kind of pantheism, the view that all things are contained in God. *De Divisione Naturae* was his chief work.

**Erin.** Poetical name for Ireland. It was popularised by Thomas Moore's *Irish Melodies*, but is of much earlier origin. Philologists assume an old Celtic form, *Iveriu* or *piveriu*, probably meaning fertile (cf. Gr. *πῖον*, fat), in old Irish *Eriū*, in the declension of which *Erin*, *Erinn*, appear. The Greek name *Iernē* = *Ivernē*, the *v* being

preserved in the Latin *Juvena* or *Juberna*, of which *Hibernia* (q.v.) is another form.

**Erin go bragh.** Irish phrase meaning Ireland for Ever. Through its association with Ireland's demand for a freer and more independent government it became a party instead of an entirely national cry. It is widely used as an expression of national sentiment.

**Erinus.** Genus of alpine herbs of the family Scrophulariaceae, natives of W. Europe. The spoon-shaped leaves, which grow in a tuft, have their broad ends boldly cut into about five pointed teeth. The leafy stem ends in a cluster of rosy-purple or white flowers.



Erinus. Roots, foliage, and flower of *Erinus alpinus*

**Erinyes.** In Greek mythology, older name of the Eumenides (q.v.), or tragic furies.

**Eriocaulaceae** (Gr. *erion*, wool; *kaulos*, stalk). Family of rush-like perennial marsh herbs. Chiefly natives of the tropics, they have slender, spongy leaves, and minute flowers gathered into a head. These flowers are either male or female, the former having two or three stamens and a rudimentary ovary, the latter with developed ovary and short style, but no stamens. Pipe-wort (*Eriocaulon septangulare*), a N. American species, occurs in muddy lakes of W. Ireland.



Eriocaulaceae. 1. Leaf of a species of *Eriocaulon*. 2. Male flower. 3. Entire plant. 4. Head of flower

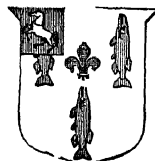
**Eriphylē.** In Greek legend, sister of Adrastus, king of Argos, and wife of Amphiarus. Before he joined the expedition of the Seven against Thebes, Amphiarus charged his son Alcmaeon to murder his mother as soon as he should hear of his father's death,

and in due course Alcmaeon obeyed his behest.

**Eris.** In Greek mythology, goddess of discord. Annoyed at not being invited with the other gods to the wedding-feast of Peleus and Thetis, she threw a golden apple into the midst of the feast inscribed "For the fairest." It was claimed by Hera, Athena, and Aphrodite, and the Trojan prince Paris had to judge. Because he chose Aphrodite, she rewarded him with possession of Helen of Greece, which led to the Trojan war.

**Eriskay.** Island in the Hebrides, Scotland, lying S. of South Uist. It is the spot at which Prince Charles Edward landed with seven companions from France, July 23, 1745; according to legend he planted a white convolvulus which will grow nowhere else. The Eriskay Love Lilt is one of the most familiar Hebridean songs.

**Erith.** Industrial town and borough of Kent, England. It is on the S. bank of the Thames, 14 m. E. of London, and is served by the electrified railway and London Transport. The town is divided into industrial and residential districts: the latter, to the S., consist of Abbey Wood, Belvedere, and Northumberland Heath. The industrial section, with a frontage of 4 m. on the river, does not intrude upon the amenities of the town. Engineering works, cable and plastic manufacture, edible oil refining, chemical works, coal shipping, lighterage, building materials, stoneware, and asbestos works provide employment. The church of S. John the Baptist has some interesting brasses: parts of it date from the 12th and 13th centuries. The Royal Alfred Seamen's Home for disabled seamen is in the town. In the Middle Ages Erith was famed for its ship-building, and the first man-of-war was built here. A borough charter was granted in 1938. It suffered damage from the Luftwaffe during the Second Great War. Pop. est. 42,000.



Erith arms

**Eritrea.** Political division of East Africa. It is a coastal strip of coral formation on the Red Sea, running about 670 m. between the Anglo-Egyptian Sudan and French Somaliland, and bounded to S.W. by Abyssinia. The coast, with a tropical climate,

is often excessively hot and moist, but the uplands are cool; rain is adequate for agriculture and is supplemented by irrigation, while pasture abounds. Products include hides, butter, palm nuts, ostrich feathers, salt, gold. Pearl fishing is carried on at Massawa and in the Dahlak Archipelago. The principal towns have been connected by rly. and motor highway. Asmara is the capital and Massawa its port. The natives speak Tigre or Tigrine and include Christians and Muslims. Area 15,754 sq. m. Pop. est. 850,000, partly nomadic.

Massawa was occupied by Italy in 1885, and the surrounding territory was formed into the

definitely ceded to Russia by the treaty of Turkmanshai, 1828. It became chief town of a government in Transcaucasia, and in 1918 centre of an Armenian republic. Here are an Armenian university and national museum. Pop. 200,000.

**Erlangen.** Town of Bavaria, Germany. It is in Franconia, 15 m. N.N.W. of Nuremberg, just where the Schwabach joins the Regnitz. Its chief buildings are the town hall and the university (1743, a former palace), and there are a number of churches, schools, etc., but none is notable architecturally. Industries concern electric instruments, beer, paper, and textile goods, the last, to which the

1906. A ballet, *Les Cent Baisers*, was one of the most successful productions of the de Basil company's seasons at Covent Garden, 1935-36. A symphonic suite and a violin concerto gained reputation.

**Erlanger, JOSEPH** (b. 1874). American physiologist. He was born Jan. 5, 1874, at San Francisco, and studied at the universities of California and Johns Hopkins. At Johns Hopkins hospital, 1899-1900, he became instructor, assistant, and associate professor at the university, 1900-1906. He was professor at Wisconsin university 1906-10, and at Washington university, St. Louis, 1910-46. A member of the National Research Council, 1922-26, and of many learned societies, he was awarded the Nobel prize for physiology and medicine in 1944. Erlanger wrote (with H. S. Gasser) *Electrical Signs of Nervous Activity*, 1937; *Symposium on the Synapse*, 1939.

**Erlau.** Variant name of the city in Hungary better known as Eger. The red wine produced in the area is called Erlauer. See Eger.

**Erl-king** or **ERLKONIG**. Figure in German mythology. He personifies an evil spirit haunting forests and plotting mischief to passers-by, especially children. The word, meaning king of the alders (Ger. *Erle*), from the vapours that cling to these trees at night, is a mistranslation, and should properly be elf-king, its meaning in Scandinavian (Dan. *Ellerkonge*). The character was introduced to German folklore by Herder's translation of the Danish ballad, *Sir Olaf and the Erl-king's Daughter*, 1778-79. It is the subject of a famous ballad by Goethe, set to music by Schubert.

**Ermeland.** A level, sandy region, stretching inland from the Frisches Haff between Elbing and Königsberg (Kaliningrad). It covers about 1,700 sq. m. The name was borne by a district in Prussia before that country passed into the possession of the Teutonic Order. It was later the principality of a bishop, who was a member of the medieval empire. In 1466 it was added to Poland, but at the partition of the latter in 1772 it was seized by Prussia. It includes Olsztyn (Allenstein), capital of the new Polish district of Masuria. The dividing line between the part of E. Prussia incorporated in Lithuania and the part incorporated in Poland by the Polish-U.S.S.R. treaty of Aug., 1945, runs through the district. Pop. (pre-war) 270,000, mostly R.C. and largely Polish.



Erith, Kent. A view of the High Street of this borough on the south bank of the Thames. See text in facing page.

colony of Eritrea in 1889. Italian enterprise was checked after a disastrous defeat by Abyssinian forces at Adowa, March 1, 1896. By an Act of 1936 the territory became a state of Italian East Africa. For the Second Great War in Eritrea, see East Africa Campaign. At the conclusion of the fighting, the country came under a British military administration which carried out improvements in agriculture and forestry, education and justice. In 1942 Eritrea was developed as a U.S. base. Consult *Short History of Eritrea*, S. H. Longrigg, 1945.

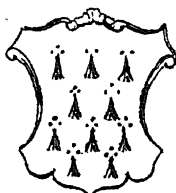
**Erivan.** Capital of Armenia S.S.R. It stands on the Sanga, near the Turkish border, 40 m. N.E. of Ararat and 145 m. S. of Tbilisi. It is the seat of a bishopric and contains the remains of an old palace of the Persian viceroys. An active trade is carried on in leather, pottery, and cotton. After being alternately in the hands of Turks and Persians, Erivan was taken by the Russians in 1827, and

town owes much of its prosperity, having been introduced by immigrant Huguenots. The university was founded by Frederick, margrave of Baireuth; it has a large library, botanical garden, and hospital, in addition to laboratories, etc. Erlangen passed in the Middle Ages from one ruler to another. It was made a town in 1398, and until 1791 was in the margraviate of Baireuth; then it passed to Prussia and in 1810 to Bavaria. Pop. 32,348.

**Erlanger, FRÉDÉRIC, BARON D'** (1868-1943). A Franco-British composer. He was born in Paris, May 29, 1868, and studied music under Ehmann. In 1891 he became a naturalised British subject, joining his brother Émile in a firm of financiers. He died April 23, 1943. As a composer he was influenced by Bizet and Chabrier, and his compositions included operas, orchestral pieces, songs, and chamber music. The best-known operas were *Inez Mendo*, 1897, and *Tess of the d'Urbervilles*,



**Ermine.** Name given to the winter phase of the stoat, when the fur is white with the exception of the black tip of the tail. In Great Britain this change from the brown of summer takes place regularly in Scotland, and often in the N. of England; but further S. it is very rare. The ermine fur of commerce comes from more northern latitudes, chiefly from Alaska; but it is now in little favour, except for official robes. The name is a corruption of *Lat. Armenius (mus)*, i.e. Armenian (mouse), or of *Ger. Hermelin*, ermine, ermine-fur. (*See Stoat.*)



**Ermine in heraldry** is represented as silver or white powdered with sable spots, usually depicted like a small arrow head surmounted by three dots. There are four variants: ermines represented as black powdered with silver spots; erminetes or erminites, represented as black with silver spots between two red hairs; erminois, black with gold spots; and pean, gold with black spots.

**Ermine Street.** Early English name for an ancient British highway from London to Lincoln, and thence to York. Incorporated in part into the Romano-British road system, it passes through London via Kingsland and Stoke Newington to Royston, thence through Godmanchester, Castor, Ancaster to Lincoln. It appears in the laws of Edward the Confessor as one of four royal roads.

**Ernakulum.** Town of India, in Travancore and Cochin, formerly cap. of Cochin; the terminus of a rly, which connects the state with the main line of the Madras rly. The Raja's College here accommodates 700 students. Pop. 41,200.

**Erne** OR SEA EAGLE (*A.S. earn*, eagle). The white tailed sea eagle (*Haliaeetus albicilla*), the only member of its group still found in Great Britain. It is of brownish colour, has a white tail, and is about 3 ft. in length. It still breeds in the Hebrides, but is becoming rare.

**Erne.** River of Eire and N. Ireland. It issues from Lough Gownagh, in co. Longford, and flows mainly N. through Lough Oughter and both upper and lower Lough Erne until it falls into Donegal Bay near Ballyshannon. Its length is 70 m. Enniskillen is the chief town on its banks, and after leaving Longford it passes

through counties Cavan and Fermanagh. The hydro-electric scheme utilising the falls of the lower Erne in and above Ballyshannon (*q.v.*) supplements the Shannon scheme. Erne salmon fishing, except in the estuary, must suffer.

**Erne.** Name of two loughs or lakes of co. Fermanagh, N. Ireland. The upper lake is 13 m. long, and in one place 4 m. wide; the lower lake is 18 m. long, and from 2 to 5 m. broad. The river Erne passes through them, the distance between the two being 10 m. The lakes occupy hollows in the limestone, and have a very irregular shape; the upper portion is merely a collection of narrow ponds abutting on the river. In both, but especially in the upper lake, are numerous islands.

**Ernest.** Masculine Christian name, probably derived from the German *ernst*, serious. The French form is Ernest; Ital. and Span. Ernesto. Its introduction into Britain dates from the 18th century: the fifth son of George III was Ernest Augustus (*v.i.*). The feminine form is Ernestine.

**Ernest Augustus** (1771-1851). King of Hanover. The fifth son of George III of England, he was born at Kew, June 5, 1771. He entered the Hanoverian army and distinguished himself during the Napoleonic wars. In 1799 he was made duke of Cumberland and Teviotdale, and in the house of lords he acted with the more extreme Tories in opposing all kinds of reform especially Roman Catholic emancipation and the reform measure of 1832. In 1810 some excitement was caused by a murderous attack made on the duke by his valet; the latter was afterwards found dead, and some went so far as to accuse Ernest of his murder.

Until the birth of a daughter, Victoria, to his elder brother Edward, he was heir presumptive to the English throne. By the operation of the Salic law he (and not Victoria) succeeded to the throne of Hanover in 1837. There he reigned for fourteen years. He would not hear of anything in the nature of constitutional reform, but in spite of troubles caused by this unyielding attitude he was popular with his subjects. He died Nov. 18, 1851, and was succeeded by his son George. His wife was Frederica, daughter of Charles, duke of Mecklenburg-Strelitz.

**Ernie, ROWLAND EDMUND PROTHERO, BARON** (1852-1937). British politician and writer. Born Sept. 6, 1852, at Clifton-on-Teme, he was educated at Marlborough

and Balliol College, Oxford, becoming fellow of All Souls. He was admitted to the bar, and in 1894 was editor of *The Quarterly Review*. An authority on agriculture, he was appointed agent-in-chief to the duke of Bedford in 1899. In 1914 Oxford University chose Prothero as one of its members, and in 1916 he was included in the Coalition government as president of the board of Agriculture. He continued in office after the general election of 1918, and was made a peer. He wrote *The Pioneers and Progress of English Farming*, 1888; *English Farming, Past and Present*, 1912; but his most popular works are *Life and Correspondence of Dean Stanley*, 1893 (with G. G. Bradley); *The Psalms in Human Life*, 1903; *The Land and Its People*, 1925. He died July 1, 1937.

**Ernst, MAX** (b. 1891). German painter. Prominent among the early surrealists, he was one of the leaders of the movement. He worked in Paris during the 1920s, and was among the first of the group, which included Dali (*q.v.*), Tanguy, and Masson, to abandon abstract form for recognizable imagery. His work was banned by the Nazis in Germany. His book illustrations, executed for the *Éditions du Carrefour* in 1930, were among his popular works.

**Ernulf** OR ARNULF (1040-1124). English ecclesiastic. He was born in France and educated at Bec, under Lanfranc. Made prior of Canterbury by Anselm, he was abbot of Peterborough from 1107 to 1114, when he became bishop of Rochester. He was a great authority on canon law, and the author of the *Textus Roffensis*, preserved in the library of Rochester Cathedral, which comprises records of the cathedral, and other historical ecclesiastical, and legal documents. This collection contains the form of excommunication entitled *The Pope's Dreadful Curse*, quoted by Sterne in *Tristram Shandy* to show his veneration for the pious bishop who had ready for use "fit forms of swearing suitable to all cases."

**Erode.** Town of Madras, India. It is in the Coimbatore district, and was at one time a place of some importance. It suffered during successive invasions of the country in the 17th and 18th centuries. The town, which is the headquarters of the divisional officer, contains two old temples. Pop. 35,000, five-sixths Hindus.

**Eroica.** Popular name of the symphony No. 3 in E flat by Beethoven (op. 55). Completed in

Aug., 1804, it was intended originally as a tribute to Napoleon, but Beethoven's later revulsion against the conqueror caused him to modify the sub-title to "In memory of a great man," and Prince Lobkowitz received the dedication. The magnificent sweep of the first movement, and the profound, sombre slow movement have caused this work to be acclaimed among Beethoven's greatest.

**Eros** (Gr., love). In mythology, the Greek name for Cupid (*q.v.*). It is also the popular name for the aluminium figure surmounting the Shaftesbury memorial fountain designed by Alfred Gilbert (*q.v.*). Erected in Piccadilly Circus, London, this winged statue, 9 ft. in height, was unveiled in 1893. During the reconstruction of the tube rly. station under Piccadilly Circus, 1925-28, it was placed in the Embankment Gardens, and it was again removed from its site during the Second Great War, being replaced June, 1947. The sculptor intended the figure to symbolise the Christian virtue of charity.

**Eros**. One of the nearer minor planets, discovered in 1898. The importance of the asteroid is that it can approach within 14,000,000 m. of the earth. At such times observations of its distance can be made accurately, and thence, its orbit being known, the mean distance of the sun from the earth can be found, this quantity being the fundamental unit of distance used by astronomers (*see* Astronomical Unit). In 1930-31 Eros came within 16,200,000 m. and international cooperation made available nearly 3,000 photographs taken with 30 telescopes in 14 different countries. Sir Harold Spencer Jones in 1941 arrived at the value 93,003,000 m. for the sun's distance.

**Erosion** (Lat. *erosio*, eating away). The wearing down of the earth's surface through the action of the atmosphere, rain, rivers, ice, and the sea and its tides. Atmospheric erosion is either chemical or mechanical. Wind transports particles and polishes surfaces over which they are carried, *e.g.* in deserts. Sudden changes of temperature cause particles of rock to split off, subsequently to be removed by wind or water. Atmosphere acts chemically through rainfall, in causing decomposition of rocks. Disintegration of rocks being thus effected, the products are afterwards removed by running water, the water usually eroding the boundaries of its course by abrasive action of materials carried.

Erosion beneath the surface of the ground is chiefly chemical, and often results in formation of caves and caverns, especially in limestone districts. Glacial erosion takes place over large areas and on an extensive scale, ice being, under certain conditions, a powerful scouring agent. Marine erosion is in continuous progress along coasts, the sea often using debris broken from cliffs by waves as battering-rams for further destruction. The burrowing of animals, *e.g.* worms, and penetration of roots of plants assist also in disintegration of land surfaces. The tendency of all erosion is to level the land. *See* Coast; Glacier; Soil Erosion.

**Erosion**. Term used in metallurgy. Metal articles can be fabricated by first grinding the metal to a powder, pressing into shape in suitable moulds, and then baking. The pulverisation is sometimes referred to as erosion. The term is also used to describe effects which lead to corrosion of metals normally protected by surface films. These effects are due to the breakdown of cavities beneath the protective layer, leaving the metal exposed to corrosive agents.

**Erotic Literature** (Gr. *erōtikos*, amatory). Literature inspired by the theme of love. The name is generally applied to poetry, and latterly more especially to poetry of a warmly impassioned character. The classical erotic poets include Anacreon, Callimachus, Sappho, and Theocritus among the Greeks; Catullus, Horace, Ovid, and Tibullus among the Latins. The troubadours of the Middle Ages carried on the erotic tradition in France, and at the Renaissance this form of literature had a revival on the continent of Europe. In English literature it reached a high level in the lyrical work of poets of the 17th century, such as Donne, Cowley, Herrick, Waller, Lovelace, and Suckling. In the 19th century, more especially in the latter half, it had a recrudescence in the poems of Rossetti and Swinburne, and in France in the writings of Baudelaire and others.

**Er Ram**. Village of Palestine. It is situated on a hill on the Jerusalem-Nablus road. Identified as the ancient Ramah (*q.v.*) of Benjamin (1 Kings 15), it formed a kind of frontier castle between the N. and S. kingdoms of Palestine, and was reoccupied after the return from captivity. It was taken by Allenby, Dec. 28, 1917, in the British advance after the capture of Jerusalem in the First Great War.

**Erratics** (Lat. *errare*, to wander). In geology, portions of rock of varying size which have been moved from their original home by natural agencies. They commonly consist of rock-fragments torn away by glaciers, and often bear scratches resulting from movement under great pressure. They occur in great profusion in glacial boulder-clays, and are often spread over high levels by glacial torrents. *See* Glacier; Rock.

**Errigal** OR ARIGAL. Mountain of Donegal, Eire, the highest point in Ulster. It is 5 m. S.E. of Gweedore and is 2,466 ft. high.

**Erroll**, EARL OF. Scottish title borne since 1452 by the family of Hay. William Hay, hereditary constable of Scotland, an honour given in 1315 to his forefather, Sir Gilbert, was made an earl in 1452. Francis, 9th earl, was active in the 16th century, being constantly in rebellion against James VI. He was then a Roman Catholic, and in league with Spain; in 1594 he led a small rising, after which his residence, Slains Castle, was destroyed. Later he became a Protestant.

A dispute as to whether Erroll or the earl marischal was the rightful constable was decided in favour of the former, and so the earls take precedence in Scotland just after the royal family. When the 13th earl died unmarried his sister succeeded to the title. The great-nephew who followed was a son of the earl of Kilmarnock who was executed for his share in the rising of 1745, but this did not affect his succession to the earldom of Erroll, and from him the later earls are descended. The 18th earl was made a peer of the U.K. as Baron Kilmarnock in 1831. Diana Denyse Hay (b. Jan. 5, 1926), since 1941 countess in her own right and 23rd holder of the title, married Capt. Iain Moncreiffe in 1946.

**Erromanga**. One of the S. group of the New Hebrides. It measures 30 m. long by 20 wide. The chief anchorage is Dillon's Bay; the chief product, copra. Here John Williams, the missionary, was killed and eaten by cannibals in 1839.

**Error**. False idea which is regarded as true; or the degree or extent to which a statement deviates from the actual. An example of the former is the belief, held for many centuries, that the sun revolves round the earth. An example of the latter is the statement that the population of England and Wales in 1931 was 40,000,000 to the nearest million,

the error in this figure being not more than plus or minus half a million. The word is used in the second sense particularly by scientists, statisticians, engineers, etc.

An error of the other type, commonly called a fallacy, is caused by an appearance of truth which is deceptive. Such an error may arise through faulty definition, misunderstanding, or wrong use of words, ambiguous statements, bad deduction, faulty observation, incorrect generalisation, confusion of cause and effect. Human history abounds in notable fallacies. Many of them are systematically dealt with in such books as Jevons's *Elementary Lessons in Logic*, Mill's *Logic*, Welton's *Manual of Logic and Groundwork of Logic*.

The advance of natural science has corrected many faulty observations and vastly improved our power to observe, and thus has tended to lessen the number of material errors; but little progress has been made towards the elimination of formal errors, *i.e.* those violating the rules of good reasoning. Terms are still used without adequate definition; we still "argue from the particular to the general," and "beg the question," mistake cause and effect, and presume where we cannot prove. We are prone to the fallacy of epithets: we believe we have proved our judgement of a person or act or thing when we have chosen a particularly strong adjective to describe it.

**ERROR IN APPROXIMATION.** In a statement such as 65,000 tons to the nearest thousand, or 0.036 inch to the nearest thousandth, the degree of approximation is stated. In the former we are told that the actual weight lies between 65,000—500 tons and 65,000+500 tons (the statement might be written 65,000 ± 500 tons); in other words, the true weight lies between 64,500 and 65,500 tons. In the second statement we are told that the true length is 0.036 ± 0.005 inch, *i.e.* it lies between 0.0355 and 0.0365 inch. The amount of error that is allowable in a statement depends on the circumstances. Thus, if we are considering the profit of a company which last year made £1,465,594 16s. 11d., it would probably suffice if we knew that the profit was £1.5 million to the nearest half-million pounds; if, on the other hand, we were considering the cost of generating electricity, say 0.1374d. a unit, we might be interested in the nearest ten-thousandth of a penny. The cook might weigh to the nearest

ounce; the research chemist to the hundred-thousandth part of a gramme.

The amount by which the statement of a quantity differs from the true quantity is called the *absolute error*. Thus, the absolute error in the statement of the company's profit as £1.5 millions was £34,405 3s. 1d. Generally the absolute error of an approximation is not more than half the unit of approximation.

**Error**, WRIT OF. Name of a writ of appeal to the king's bench in criminal cases, or to the court of exchequer chamber or the house of lords in civil cases. It was for errors appearing on the record, but it is now abolished in all cases.

**Ersatz** (Ger., equivalent, substitution). Term used in Germany to denote artificial substitutes for natural materials. The word came into use in the First Great War, when it was originally applied to coffee made from acorns and to sugar extracted from wood. During the Second Great War, the greater part of German commodities of everyday consumption, *e.g.* food, clothing, utensils, etc., were of ersatz materials or had an ersatz basis. Ersatz or substitute materials have been developed all over the industrial world and may be said to include plastics, buna, and rayon. See *Synthetic Chemistry*.

**Ersch**, JOHANN SAMUEL (1766–1828). German bibliographer. He was born at Grossglogau, Silesia, June 23, 1766, and studied at Halle. He was successively librarian, 1800, and professor, 1803, at Jena, and principal librarian, 1808, at Halle. His *Handbuch der deutschen Literatur seit der Mitte des 18ten Jahrhunderts*, 1812–14, laid the foundation of modern German bibliography. In 1818 he began, with J. G. Gruber, the famous *Allgemeine Encyclopädie der Wissenschaften und Künste*, which was not completed a century later. He died at Halle, Jan. 16, 1828.

**Erse**. Early Scottish variant of Irish. In the 14th–15th centuries the term was used of kings and caterans. In the 18th century it denoted Gaelic speech; at first Scottish Gaelic, and subsequently Irish Gaelic. It is no longer in current usage in this sense. In philology it sometimes designates the language-group embracing Gaelic and Manx, which is now usually called Goidelic, being brought to Britain by the Goidels, the precursors of the Brythons (*q.v.*). See *Gaelic Language and Literature*, Goidels; Ireland: Language and Literature.

**Erskine**, THOMAS ERSKINE, 1ST BARON (1750–1823). British lawyer. A younger son of the 10th

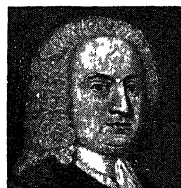


1st Baron Erskine,  
British lawyer  
After Hoppner

earl of Buchan. He was born in Edinburgh, Jan. 10, 1750. After a scanty education at Edinburgh and St. Andrews, he abandoned careers in both navy and army, and in 1778 was called to the bar. Erskine's success was instantaneous. He made his name in his first case, and in 1781 added to his reputation when junior counsel for Lord George Gordon. In 1783 he was elected M.P. for Portsmouth, and after six years' absence he was again returned for that borough in 1790. He defended Paine, Tooke, and others who wrote in favour of the French Revolution. Having been attorney general and chancellor to the prince of Wales, he was lord chancellor in the Whig ministry of 1806–07. He was then raised to the peerage, and died Nov. 17, 1823. *Consult* Speeches, ed. J. Ridgway, with Memoir by Lord Brougham, 4 vols., 1847; *Lives of the Chancellors*, Lord Campbell, 4th ed. 1856–57.

Erskine's eldest brother, Henry (1746–1817), was also a distinguished advocate. Trained at St. Andrews and Edinburgh for the Scottish bar, he was lord advocate in 1783, and again in 1806–07. He died Oct. 8, 1817. Like his brother's, his reputation rests upon his stately and pleasing eloquence.

**Erskine**, EBENEZER (1680–1754). Scottish divine and founder of the Secession Church. Born at Dryburgh, Berwickshire, June 22, 1680, he was educated at Edinburgh University. His first charge was at Portmोक Kinross-shire, whence he moved to a church at Stirling. There he came into collision with his ecclesiastical superiors, and the matter came to a head when, in 1732, he declared that parishes should choose their own ministers. This led to his suspension, but with some associates he founded a separate presbytery, which developed into the Secession Church.



Ebenezer Erskine,  
Scottish divine

In this Erskine remained until 1748, when the section opposed to him secured his removal from the ministry. He died at Stirling, June 2, 1754. His *Life and Diary* appeared in 1840. See Presbyterianism; Secession Church.

**Erskine, JOHN**, of DUN (1509-91). Scottish reformer. He was educated at King's College, Aberdeen, travelled on the Continent, and in 1534 returned with a French scholar, who introduced the study of Greek into Scotland. His enthusiasm was equally divided between the new learning and the new faith. He was an intimate friend of John Knox, and his influence was always exerted in the direction of moderation. He was moderator of the general assembly and in 1579 was appointed a member of the king's council.

**Eruptive Rocks.** Rocks which have been either extruded at the surface of the earth or have consolidated beneath the surface under pressure of overlying rock-masses. Those extruded (effusive rocks), as in volcanic eruptions, are of the type of lava and are found near volcanoes, active or extinct; they frequently exhibit flow-structure, indicating rapid consolidation. Basalts and rhyolites are examples.

Rocks consolidated beneath the surface (intrusive rocks) are of two kinds: very deep-seated (plutonic) and less deep-seated (hypabyssal). Plutonic rocks are usually coarsely crystalline, never glassy or with vapour cavities; hypabyssal rocks are often coarsely crystalline, but show great variation in structure. Intrusive rocks occur as areas of great extent and irregular shape (batholiths), as spreading sheets forced up from below between other strata (laccoliths and sills), as filling the pipes of old volcanoes (necks), as occupying more or less vertical fissures (dykes), or as branching injections (veins). See *Geology*; *Rock*.

**Ervine, ST. JOHN GREER** (b. 1883). Northern Irish dramatist and dramatic critic. Born at Belfast, Dec. 28, 1883, he became interested in the theatre at an early age. His first play, *Mixed Marriage*, was produced in 1911 at The Abbey Theatre, Dublin (of which he was manager in 1915). Of forceful disposition, he was a rugged individualist, and his most successful plays included *Jane Clegg*, 1913; *The Ship*, 1922; *The First Mrs. Fraser* (adapted from his novel of the same name), 1929; *Anthony and Anna*, 1935; *Robert's Wife*, 1937. He wrote novels, studies of Carson and Parnell,

lives of General Booth and Viscount Craigavon, and books on theatre craft, e.g. *The Organized Theatre*, *The Theatre in My Time*. An able controversialist on many subjects, he was for many years dramatic critic to the *Morning Post* and the *Observer*.

**Erymanthus** (mod. Olonos). Mountain of Arcadia, ancient Greece. The loftiest peak in the Kalliphonia range, it is associated with the story of Hercules and the Erymanthian boar which haunted this region and was slain by the hero. Alt. 7,296 ft.

**Erysipelas** (Gr. *erythros*, red; *pella*, skin). Acute contagious disease due to infection by the micro-organism *Streptococcus pyogenes*. Infection occurs through some injury to the surface of the skin, which may be quite trivial, such as a cut while shaving. It was formerly believed that the disease could arise without a wound, the so-called "idiopathic" form, but it is now recognized that in every case there is some lesion, however small. The skin rapidly becomes swollen and red, the inflammation advancing with a more or less well-defined margin and dying away behind this. The face is most frequently involved, and the swelling may cause the eyes to close. The temperature rises to 103° F. or more, and delirium may occur.

The duration of the disease is variable, but generally it lasts from one to three weeks. Death in healthy adults is rare, but in aged, debilitated persons and chronic alcoholics the outlook is not so good. Recently delivered women exhibit an increased liability to the disease. Treatment is by the sulphonamide and streptomycide group of drugs and by the use of antistreptococcal serum. Ichthyol has been found to be a useful local application, and belladonna or opium may be used to relieve pain. The patient must be isolated.

**Erythema** (Gr. from *erythraînein*, to make red). Redness of the skin owing to dilation of the small blood-vessels. The condition may be localised, when it may be due to simple inflammation, burning, or irritation by chemical substances, or it may be more or less present over the whole body, when it is usually a symptom of infectious fever, e.g. scarlet fever or measles; or of poisoning by unsound food or certain drugs, particularly belladonna, or is a manifestation of disease of the skin.

**Erythrite** (Gr. *erythros*, red). Sweet-tasting carbohydrate alcohol known under various synonyms

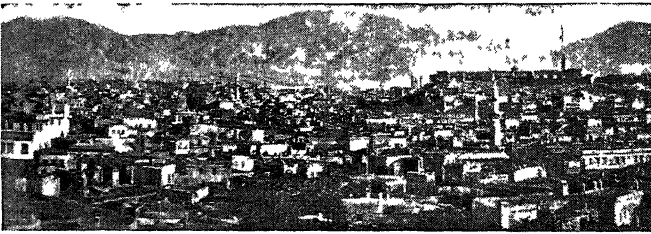
e.g. erythritol, erythrol, erythroglucin, erythromannite, lichen sugar, phycite, tetrahydroxybutane. First prepared by Stenhouse in 1848 from several species of lichen such as orchella weed (*Roccella tinctoria*), it occurs in the free state or combined with orsellinic acid, or may be made synthetically. It crystallises in large transparent prisms, with a melting point of 126° C.

**Erythrite** or **COBALT BLOOM**. A cobalt mineral, hydrous cobalt arsenate,  $\text{Co}_3\text{As}_2\text{O}_8 \cdot 8\text{H}_2\text{O}$ , peach-red in colour and occurring in monoclinic prismatic crystals, often in globular or earthy incrustations. It is of secondary origin, formed from primary cobalt minerals in the upper and oxidised portions of deposits. See *Cobalt*.

**Eryx** (mod. Monte San Giuliano). Mountain of Sicily near Drepanum (Trapani). It was crowned by a famous temple of Aphrodite, who was locally called Erycina. The temple derived its revenue from 17 Sicilian towns belonging to it. On the W. slope of the mountain is the decayed town of Eryx. Its old Roman walls still exist beside the ruins of the temple. The mountain is 2,465 ft. high.

**Erzberger, MATTHIAS** (1875-1921). German politician. Born at Buttenhausen, Sept. 20, 1875, and educated at Freiburg, he devoted himself to the study of political economy. Interested in the Christian Socialist movement, in 1897 he was a delegate at the international conference at Zürich. He entered the Reichstag in 1903, and came into prominence in 1917 when, as a member of the Catholic or Centre party, he made a speech accusing ministers of misrepresenting the military situation, and demanding the reform of the Prussian franchise and a statement of the peace aims of Germany. In 1918 Erzberger was secretary of state when Prince Max of Baden was imperial chancellor, and in 1919 was minister of finance and vice-premier, an honest and far-seeing politician. He resigned in Feb., 1920, and was assassinated on Aug. 26 of the following year.

**Erzerum** or **ERZURUM**. Town of Asiatic Turkey and capital of a vilayet of the same name. It lies in a wide plain at an alt. of 6,250 ft. above sea level, 120 m. S.E. of its port Trabzon, 150 m. W. of Mt. Ararat, and is an important commercial town and military position. It is walled and its streets are narrow and crooked. It has few fine buildings, the chief being the Armenian and Greek churches.



Erzerum. The mountain city of Armenia, once a frontier fortress of the Ottoman Empire. To the right is the medieval citadel

Erzerum is the seat of an Armenian bishop. Leather goods provide the industries. Pop. 52,534; vilayet, 371,394.

Its main importance came from its position strategically with respect to Russia. Under the Turks, who occupied it in the 16th century, it was made into a fortress and was the headquarters of an army corps. It was taken by the Russians in 1829 and again in 1878. During the First Great War it was brilliantly captured by the Russians in Feb., 1916, but during the winter of 1917-18 it was abandoned by the Bolshevik government, and was reoccupied by the Turks in March, 1918, in spite of strong resistance by the local Armenians. Erzerum was the scene of massacres of Armenians in 1895 and again in 1915.

**Erzgebirge** OR ORE MOUNTAINS. Mountain range of Central Europe, partly in Saxony and partly in Bohemia, stretching for about 90 m. from the Elbe to the Elstergebirge. The highest peaks are in the centre, the Keilberg being over 4,000 ft. high. Only a little lower are the Fichtelberg and the Spitz-

resorts in the mountains which are visited both for health and pleasure, much of the scenery being very fine. The hills are densely wooded and the district is well served by railways.

**Erzingan** OR ERZINJAN. Town of Asiatic Turkey, the medieval Arsinga. This formerly important military centre of the Turks lies on the W. Euphrates (Kara Su) about 75 m. W. of Erzerum, and is the principal town of a vilayet. During the First Great War it was the headquarters of a Turkish army corps, and as a military base was second in importance only to Erzerum. It was taken by the Russians in July, 1916. Many of its Armenian inhabitants were massacred in 1915. Silk and cotton are manufactured. The town lies at an alt. of 3,900 ft. above sea level. Pop. of vilayet, 158,498.

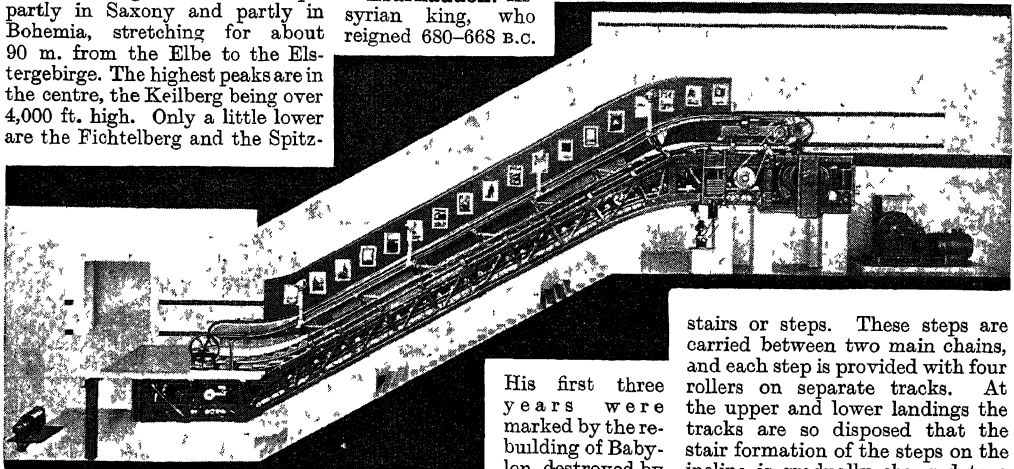
**Esarhaddon.** Assyrian king, who reigned 680-668 B.C.

**Esau.** Son of Isaac and elder brother of Jacob, whose great rival he became after the younger brother had secured by a trick the privileges of primogeniture (Gen. 25 and 27). Esau became a hunting man, married wives of Hittite nationality, and founded a tribe which occupied the mountains S. of the Dead Sea. In his later days he was on friendly terms with Jacob, but his descendants were always hated and despised by the Jews. See Jacob.

**Esbjerg.** Seaport of Denmark, in Ribe co., Jutland. It stands on the North Sea, opposite the island of Fanø, 56 m. by rly. W. of Fredericia, and is the principal port on the W. Jutland coast. The harbour was built in 1868-74 and is state subsidised. Its exports to Great Britain mainly consist of bacon, beef, cattle, and dairy produce. The fishing and manufacturing industries are important. Pop. 33,155.

**Escalade** (Lat. *scala*, ladder). Medieval method of attacking a fortification. The walls were climbed by scaling ladders or by a staircase or ramp of faggots placed against them.

**Escalator.** A moving inclined continuous stairway, with handrails which move in the same direction and at the same speed as the



Escalator. Diagrammatic view of an escalator as used at underground stations and in department stores  
By courtesy of Waygood-Otis, Ltd.

berg. On the south the range has a precipitous face, but on the north, or Saxon side, it slopes more gradually to the plain. The range, as the name suggests, is rich in minerals, silver, lead, tin, copper, iron, and some gold and uranium being found here. There are holiday

ducting campaigns against Cilicia, Arabia, and Elam, he sacked Sidon, 676, and Memphis, 670. At Shamaal he set up a stela with his portrait in relief, and erected palaces at Nineveh and Calah. His son Ashurbanipal succeeded him. See Sinjerli.

stairs or steps. These steps are carried between two main chains, and each step is provided with four rollers on separate tracks. At the upper and lower landings the tracks are so disposed that the stair formation of the steps on the incline is gradually changed to a flat platform formation, level with the landing. The tread of each step is provided with a series of cleats, which engage with combs at the upper and lower landings.

Escalators are driven by electric motors through suitable gear reduction units, and have brakes by which they may be held stationary when not in use. There are safety devices for stopping the escalator

in the event of excessive speed or accidental reversal. Escalators are of particular advantage where large numbers of persons have to be transported between two levels, e.g. at underground railway stations or in department stores.

**Escallonia.** Genus of evergreen shrubs belonging to the family Saxifragaceae, natives of S.



Escallonia. Foliage and flowers of *Escallonia macrantha*

America. The undivided, leathery leaves are covered with resinous glands which render them somewhat sticky. The tubular white, pink, or red flowers are disposed in small clusters at the ends of branches.

*E. rubra* and *E. macrantha* are much grown in the S. of England near the sea as garden hedges. The shrub is named after Escallon, a Spanish traveller.

**Escanaba.** City of Michigan, U.S.A. The co. seat of Delta co., it is on an arm of Green Bay, Lake Michigan, and lies 116 m. N.N.E. of Green Bay, Wis. It has a rly. station and airport. There are docks for shipping the iron ore of the district, also rly. repair shops. Trade is in fish and charcoal; manufactures include furniture and lumber products. Escanaba was settled in 1846 and made a city in 1883. Pop. 14,830.

**Escape.** Play by John Galsworthy. Produced at the Ambassadors' Theatre, London, Aug. 12, 1926, it shows in a prologue and nine "episodes" the reactions of various people encountered by a convict escaping from Dartmoor in the few hours before he is captured. The prologue establishes initial sympathy for the convict, Matt Denant, a part created by Nicholas Hannen. Sir Gerald du Maurier played the part in a film version, 1931.

**Escapement.** That part of a clock, watch, or chronometer which controls and regulates the motive force, produced by weight or spring, so that correct time may be indicated on the dial. An escapement has two tasks to perform: to allow the teeth of a wheel to escape, or pass a given point, one at a time, so that the motive force is allowed to trickle through in carefully measured and

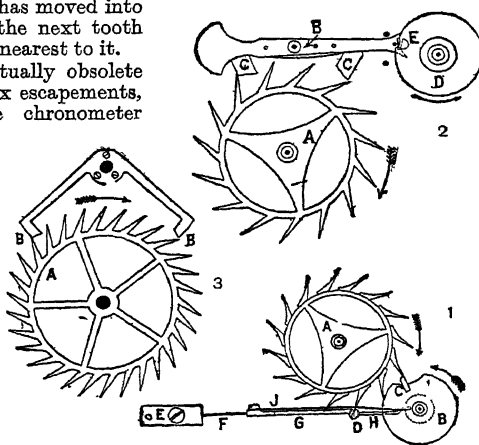
pre-determined periods of time; and to give impulse to pendulum or balance, so that constant motion will be maintained so long as the motive force continues to operate. Hundreds of escapements have been invented, of which about six have stood the test of time.

The verge escapement was the first of all but is now quite obsolete. Its inventor is unknown, but it was in use for clocks by the 14th century and continued until the middle of the 17th; for watches 100 years longer. In clocks the escape or crown wheel is mounted on the fastest moving arbor. The verge is a vertical arbor, suspended by a cord from a suitable cock and pivoted at its lower end in a bearing. Two pallets project from the verge at right angles to each other, in line with the teeth at the top and bottom of the crown wheel respectively. Higher up on the verge is a horizontal bar, the balance, with a weight at each end, the moving of which nearer to or farther away from the centre makes the balance swing faster or slower. The action of the escapement is simple. The balance is oscillated in one direction, when one of the pallets, which is holding up the rotation of the crown wheel by engaging one of its teeth, is gradually turned on its axis until the tooth it is holding is allowed to escape. By this time the other pallet, set at right angles to the first, has moved into position to catch the next tooth of the crown wheel nearest to it.

Ignoring the virtually obsolete cylinder and duplex escapements, we come to the chronometer escapement. Invented independently by Arnold and Earnshaw about 1782; the Earnshaw version is the better. The balance is almost entirely "free" from interference by the train, except while receiving impulse on alternate vibrations. The most general use is for marine time-keeping. The working of three forms of escapement is shown in the diagrams in this page. The chronometer escapement is shown in Fig. 1. A tooth of the escape wheel A is shown at rest on the locking pallet D. B is the impulse roller, E the foot of the detent. The discharging pallet, shown in

dotted lines, comes in contact with a gold spring J, which, in turn, presses on the end of detent H, forcing it back and bending a spring F, so releasing the escape wheel. A tooth falls on the pallet C, the escape wheel communicates an impulse to the balance, and as soon as the pallet has turned sufficiently to allow the escape wheel tooth to drop off, the tooth in front is caught on the locking pallet D, the detent G having meanwhile sprung back into place immediately on being freed from the discharging pallet.

The lever escapement, invented by Thomas Mudge about 1765, is used in almost all good watches today. The balance actuates a lever by means of a roller, which engages in a notch in one end. As the balance swings the roller carries the lever to one side; one of the pallets allows a tooth of the escape wheel to pass, at the same time giving impulse, while the other holds the wheel up again. The lever escapement generally in use is shown in Fig. 2. The escape wheel A has pointed teeth working into two pallets C C, which have pieces of ruby sunk into their working faces. The pallets are fixed to a lever B, which has a notch at one end engaging with a small pin E set into a roller D, on the axis of the balance wheel. In the figure the impulse pin has just entered the notch of the lever and is



Escapement. 1. Chronometer escapement. 2. Lever escapement. 3. Graham's dead-beat escapement. For descriptions see text

about to unlock the pallet. Energy is imparted to the impulse pin by the balance spring. The movements of the lever are kept within their proper limits by means of pins placed in suitable positions.



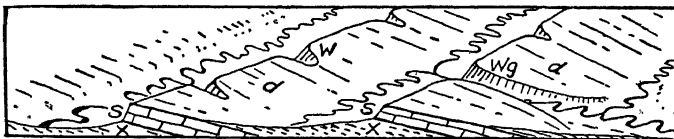
**RECOIL ESCAPEMENT.** Invented by Dr. Robert Hooke (1635-1703), this is the most important contribution to timekeeping by pendulum clocks. The pendulum was first applied to the verge escapement, which was mounted horizontally instead of vertically, and this gave much more accurate timekeeping, since the swing of the pendulum was more accurate than that of the foliot which it superseded. Hooke realized that timekeeping by pendulum clocks could never be really good unless the pendulum arc could be much less than the 45-50° required with the verge escapement. He accomplished the anchor escapement, the arc of which could be made as small as 1-2°. The anchor escapement is still fitted to moderately priced pendulum clocks.

**DEAD BEAT ESCAPEMENT.** George Graham (1673-1751) invented this mechanism, which is so fashioned as to allow the escape wheel to drop dead, without recoil, on to the pallet which arrests its further movement. This escapement is expensive and delicate, and is largely used in turret clocks and for regulators. The dead-beat escapement is shown in Fig. 3. A is the escape wheel, B B the pallets. (See page 3135.)

**GRAVITY ESCAPEMENT.** For large public clocks this is now generally employed. With the recoil and dead beat escapements additional weight can cause erratic timekeeping, and when a number of pairs of heavy hands have to be driven, considerable weight is necessary. Wind also can have a serious effect on the hands. In 1854 Sir Edmund Denison (later Lord Grimthorpe) applied "double three-legged escapement" to the clock familiarly known as Big Ben. The principle of the gravity escapement is that the pendulum in its swing unlocks the pallets, while the weight or motive force causes them to be lifted so as to impart impulse. The escape wheel comprises two three-toothed wheels mounted in different planes, while the pallets are two gravity arms mounted above the escape wheel and having studs on their lower ends which bear on the pendulum. Each gravity arm has a projection which engages one of three pins between the double escape wheel, and after one of the pallets has followed the pendulum to its zero point, thus by its weight giving impulse, it is lifted by the motive force turning the escape wheel, and by the pin engaging the projection

on the gravity arm. When the pendulum swings on its return journey it lifts this gravity arm still farther, thus unlocking the escapement, while the other gravity arm is then lifted. The amount of power on the train has no relation to the impulse, which remains as constant as possible.

**Escarpment.** In geology, an asymmetrical ridge formed by gently dipping hard beds which lie between softer strata. The less resistant material is eroded away and the hard rock is left projecting. The precipitous edge of the hard beds is called the scarp-face (*ss*). The gently inclined surface



**Escarpment.** Diagram illustrating the formation of two escarpments. The lettering is explained in the text

which owes its inclination to the dip of the top of the beds is the dip-slope (*dd*). Valleys or gorges occupied by rivers which cut through escarpments are referred to as water-gaps (*Wg*). Marked notches in the ridge through which past streams, now diverted, may once have flowed are wind-gaps (*W*). With increase in the dip of the beds the dip-slope becomes steeper until it equals the inclination of the scarp-face; the symmetrical ridge so formed is a hog's back. Extensive uplands of escarpment form are known as *cuestas*. Interbedded soft strata are marked X on the diagram. The steep edges of flat tablelands are sometimes referred to as escarpments. Examples in England are the Cotswold Hills overlooking the Severn; Wenlock Edge; the N. and S. Downs; and the Chilterns. Escarpment-like ridges may be formed by faulting, as in New Zealand and Western U.S.A., where parallel faults have broken the rocks into elongated blocks which have been tilted. Each block is thus bounded by a steep fault-scarp face and a gentle rear- or dip-slope. Mountains formed this way are usually termed block-mountains. See Fault.

**Escaut Line.** Defence line of the Second Great War hastily established on the W. bank of the river Escaut or Schelde (*q.v.*), following the German breakthrough at Maastricht in May, 1940. With its right flank on Ghent and its left on Tournai, the

line was held by the British and Belgian armies from May 11 until May 23, when the German capture of Abbeville so disrupted Allied communications that the line was abandoned and the B.E.F. fell back on the Lys. See British Expeditionary Force.

**Eschatology** (Gr. *eschatos*, last; *logos*, discourse). Term used for that branch of theology which deals with the four last things: death, judgement, the life after death, and the return of Christ to the earth. All ancient religions and some philosophies paid considerable attention to such a doctrine, the teaching of the ancient Egypt-

tians on life after death being especially detailed. The Bible contains little on the subject. The earlier books of the O.T. appear to take for granted that personality will survive death, and gradually unfold the idea of rewards and punishments after death. The teaching of Christ and His apostles emphasised these truths, but added little to our knowledge. Such passages as the parable of the rich man and Lazarus and the descriptions in the book of Revelation are couched in the language of Oriental imagery, and were not intended to be taken literally.

The general teaching of the Christian Church on the subject has been marked by great reserve, with the exception of the Church of Rome in the Middle Ages, when the doctrine of purgatory was developed in detail. The present attitude of theologians is one of opposition to speculation on the subject. See Immortality; Survival.

**Escheat** (Lat. *excidere*, to fall out). Term used in law for the reversion of land to its ultimate owner because there is no other heir. It is a relic of feudal times when land was granted by the king or other lord on the condition that in certain contingencies it escheated or came back to him. Land also escheated when the holder was attainted, the theory being that his blood being thus corrupt, his heirs could not inherit. This, however, was abolished in England in 1870. The majority of escheats fell to the crown. Escheat through failure of heirs was abolished in 1925,

though land like other property may pass to the crown as *bona vacantia* on the death of its owner. See Feudalism.

**Eschscholtz Bay.** Inlet of Alaska. Arm of Kotzebue Sound, Bering Strait, near the Arctic Circle, its name commemorates J. F. Eschscholtz, Russian naturalist.

**Eschscholtzia.** Botanical name for the genus containing the perennial herb Californian poppy (*q.v.*).

**Eschwege.** Town of Germany. It stands on the Werra, 38 m. E.S.E. of Kassel, in the Land of North Rhine-Westphalia. The old buildings include a 14th century castle, restored in 1581, and the tower of an 11th century monastery. The industries include weaving and tanning. The town was part of Hesse from 1264 until taken by Prussia after the war of 1866. Pop. 13,700.

**Eschweiler.** Town of Germany, in North Rhine-Westphalia. It is on the Inde, 8 m. E.N.E. of Aix-la-Chapelle, and stands on a large coalfield. The chief industries were the manufacture of iron, steel, and zinc goods, engineering, brewing, and tanning. Captured by American troops after three days' hard fighting, on Nov. 22, 1944, it was lost again in the Ardennes counter-offensive, to be recaptured by the U.S. 3rd army on Jan. 22, 1945. Pop. pre-war 33,090.

**Escobar y Mendoza, ANTONIO** (1589-1669). Spanish philosopher. Born at Valladolid, he entered the Society of Jesus and gained fame as a popular preacher. In his *Summula Casuum Conscientiae*, 1627, he formulated the maxim that the end, if pure, always

justifies the means, even when the actions may be immoral or illegal. This statement was satirised by such writers as Pascal, Molière, La Fontaine, and Boileau. In France indeed Escobar's name gave rise to the term *escobardeerie* for moral laxity. He died July 4, 1669, at Valladolid.

**Escombe, HARRY** (1838-99). South African politician. Born July 25, 1838, and educated in London, he emigrated to the Cape in 1859 and joined the commercial staff of the Natal Mercury. In 1872 he was elected to the legislative council of Natal. He fought through the Zulu (1879) and Transvaal (1881) wars, and defended Dinizulu successfully against the charge of rebellion. In 1893 he was made attorney-general and devoted himself to developing the commercial resources of the colony. Elected premier in 1897, he came to London for the queen's diamond jubilee. He died Dec. 27, 1899. His collected speeches appeared 1903.

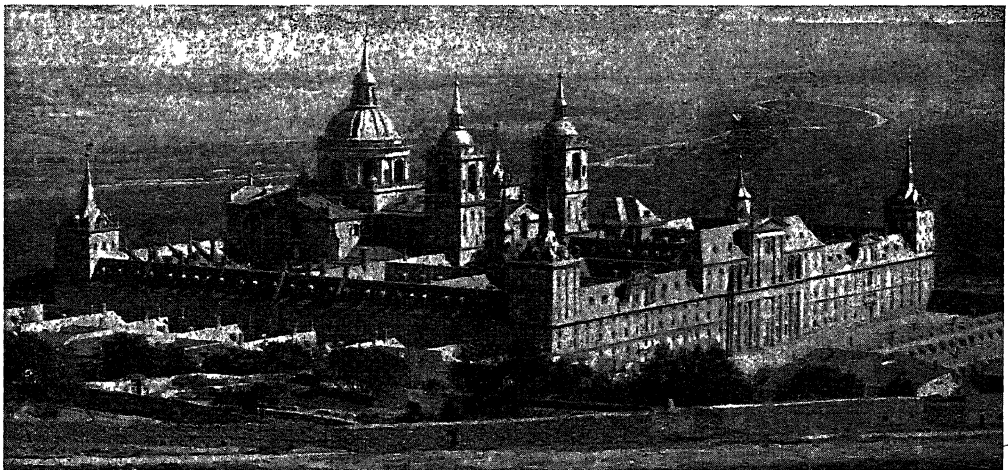
**Escott, THOMAS HAY SWEET** (1844-1924). A British author. Born at Taunton, he was educated at Queen's College, Oxford. Lecturer in logic and deputy-professor of classical literature at King's College, London, 1866-73, he edited the *Fortnightly Review*, 1882-86, and was for many years leader writer on the *Standard*. His books include *England: its People, Polity, and Pursuits*, 1870; *Social Transformations of the Victorian Age*, 1897; *The Story of British Diplomacy*, 1908; *Masters of English Journalism*, 1911; *Great Victorians*, 1916; *National and International Links*, 1922. He died June 14, 1924.

**Escrow.** Deed delivered by the person executing it to some third person on the terms expressed either in writing or by word of mouth that the deed is not to be delivered to the other party to it or become effective unless some condition is fulfilled—*e.g.* that the purchaser of land conveyed by the deed shall have paid the purchase money. A deed cannot be delivered as an escrow to the other party to the deed or to his agent.

**Escudo** (Port., shield). Silver coin, monetary unit of Portuguese currency since May 22, 1911. Divided into 100 centavos, it replaced the old milreis gold piece. In 1950 the official exchange rate was 80½ escudos to the £1 sterling. There are coins of 10, 5, and 2½ escudos. The shield with the national arms is on the obverse. In Spain, a silver escudo, equal to 10 reals, was used 1864-68.

**Escuintla.** City of Guatemala, 50 m. S.E. of Guatemala City and reached by rly. or motor road. In a fertile tropical valley, it produces grain and fruit. At Concepción, 2 m. distant, is an airport. Pop. 47,400.

**Escorial** (Span. *El Escorial*). Palace and monastery of Spain, situated 31 m. by rly. N.W. of Madrid, on a spur of the Guadarrama mts. It was designed for Philip II of Spain by Juan Bautista de Toledo, the first stone being laid April 23, 1563. His pupil, Juan de Herrera, carried on the work, which was completed Sept. 13, 1584. Philip dedicated the building to S. Lorenzo in commemoration of his victory over the French on that saint's day, Aug. 10, 1557. Intending it to be



Escorial. Spanish palace and monastery, covering nearly 400,000 sq. ft., seen from the north-west. In the centre is the great church, and the palace, college, and convent occupy parts of the surrounding buildings

a retreat in which he could meditate upon his own end, he ordered that the structure should be of the plainest character.

It is built of grey granite, in the severest Doric style. The plan is that of an immense rectangle, with a comparatively small rectangular wing, embodying the Palace of the Infantas, projecting beyond the E. side. The façades are pierced by rows of small rectangular windows, each row marking a storey. At each of the four angles of the main structure is a tower with pyramidal spire; there are two church towers 230 ft. in height, with the great dome of the church crowning the whole. The main entrance, in the centre of the W. front, is severely Doric, in keeping with the façade. The door itself is 20 ft. high by 10 ft. wide; above it is a colossal statue of S. Lorenzo, the work of the sculptor Monegro. The head, hands, and feet of this statue are wrought in white marble, but the rest of the figure is granite. This entrance leads into a vestibule 75 ft. wide, flanked on the right hand by the convent, including library and refectory, and on the left by the college.

The central space is occupied by the church, the plan of which was based on the original one of S. Peter's, Rome. The dome and lantern are carried on four enormous piers, from which spring the arches of the three naves. Below the high altar is the famous Pantheon of the kings and queens of Spain, beginning with Charles V. The decoration of this octagonal chamber, consisting of precious marble linings, dates from 1654. There are 26 sepulchral urns of dark marble. Distributed over the church are paintings by Tintoretto, Titian, El Greco, Zurbaran, and Ribera in the sacristy, and the masterpieces of Coello in the chapels.

On the N. side is the palace, in the N.E. corner of which were the apartments of Philip himself. In the room in which he died was a panel, by opening which the king could look down upon the high altar of the church. Other apartments of the palace were added to and embellished by later monarchs. There are tapestries after Goya and Teniers. Philip II was the founder of the Escorial library. Don Diego de Mendoza, the Inquisition, and Augustin, archbishop of Tarragona, were other donors, the collection being further increased by confiscated libraries, and by the rule that a

copy of every book published in Spain should be presented to it.

The Hermits of S. Jerome were the first tenants of the monastery, which was stormed in 1808 by French troops; only part of the looted treasure being restored at the peace of 1814. In 1885 Augustinians occupied the monastery.

The Escorial was not damaged in any way during the Spanish civil war of 1936-39.

**Escutcheon** (old Fr. *escuchon*, Lat. *scutum*, shield). In heraldry, term used to describe a shield blazoned with armorial bearings or other insignia. See Shield.

**Esdraelon**, PLAIN OF. District of Palestine. It is sometimes called the plain of Jezreel, a term which applies more specifically to its eastern extension towards the Jordan. An historic tract of country, it has been the scene of many battles, from Gideon's victory over the Midianites to the actions fought by Allenby's cavalry in his conquest of the Holy Land during the First Great War. It lies S.E. of Haifa, between Mt. Carmel and the MOUNTAINS OF GILBOA, in N. Palestine,

Literature in the O.T. Apocrypha. 1 Esdras was used by Josephus, and may have been composed in the first century B.C. 2 Esdras was probably written in the reign of Domitian (A.D. 81-96). The author appears to have witnessed the destruction of Jerusalem in A.D. 70 (chap. 3); and in the Eagle Vision the eagle seems to represent Rome.

**Eserine Sulphate**. Sulphate of an alkaloid extracted from *Physostigma venenosum*, the Calabar bean. It produces contraction of the pupils, and in minute doses is useful in various affections of the eye. In large doses it is poisonous.

**Esh**. Village and parish of Durham, England. It is 5 m. W. of Durham, and is a mining centre. Near here, at Ushaw, is the R.C. college of S. Cuthbert, the successor of the one at Douai. It has a collection of pictures and antiquities, while its chapel was designed by Pugin. S. Michael's is the chief church of Esh. Pop. 1,100.

**Esher**. Urban district of Surrey, England, a residential suburb of London. Esher parish stands



Esher, Surrey. The main Portsmouth road looking towards Guildford. In the centre of the picture is the old Bear Hotel, set back from the highway

and is the Armageddon of the Apocalypse. Watered by the Kishon, the plain is very fertile.

**Esdras**, THE BOOKS OF. Several works bear the title Esdras. One of these (O.T. Apocrypha) contains substantially the same materials as the Biblical books known as Ezra, Nehemiah, and 2 Chronicles. In the Septuagint and in the Latin and Syriac versions this is called 1 Esdras; but in Latin bibles since the time of Jerome, 3 Esdras (the O.T. books of Ezra and Nehemiah being reckoned as 1 and 2 Esdras). Modern scholars prefer to call it "Greek Esdras." The other work in the O.T. Apocrypha is commonly called 2 Esdras, but sometimes 4 Esdras. It contains seven visions, and is the only specimen of Apocalyptic

on the Portsmouth Road near the little river Mole. Pleasantly situated, it is 15 m. S.W. of London by electric rly. Esher Place beside the Mole, built by William of Waynflete in 1460, and now represented by a tower (ruined, then restored), was the residence of Wolsey after his fall in 1529. One mile S. is Claremont (q.v.). The urban district includes Claygate, Cobham, E. and W. Molesey, Hinchley Wood, Stoke D'Abernon, Oxshott, Thames Ditton, and Long Ditton. Pop. est. 47,900.

**Esher**, WILLIAM BALIOL BRETT, 1ST VISCOUNT (1817-99). British judge. The son of a clergyman, he was born Aug. 13, 1817, and went from Westminster School to Caius College, Cambridge. In 1840 he became a barrister, and he entered

the house of commons as Conservative M.P. for Helston in 1866, a tie at this election ending in the house allowing both candidates to sit. In 1868 Brett was made solicitor-general, but very soon he left political life to become a judge of the court of common pleas. In 1876 he was promoted to be a lord justice, and in 1883 to be master of the rolls. He retired in 1897, and died May 24, 1899. In 1885 Brett was made Baron Esher and in 1897 a viscount.

**Esher, REGINALD BALIOL BRETT, 2ND VISCOUNT** (1852-1930). British politician. Born

in London, June 30, 1852, he was the son of the judge created Viscount Esher (v.s.). Educated at Eton and Trinity College, Cambridge, he was Liberal M.P. for Pen-



2nd Viscount Esher  
British politician

ryn and Falmouth 1880-85. He was secretary to the office of works 1895-1902, and enjoyed the confidence of both Victoria and Edward VII, under whom he was deputy-governor of Windsor Castle. Esher took a great interest in the Territorial Force, and was on the committee of imperial defence. His publications include *Ionious*, 1923; *Cloud-Capped Towers*, 1927; and, with A. C. Benson, he edited the *Letters of Queen Victoria*, 1907. Dying Jan. 22, 1930, he was succeeded by his son Oliver (b. 1881). Another son, Maurice V. Brett, published his *Journals and Letters*, 1934.

**Eshowe.** Town of Zululand, Natal. It is 40 m. S. of Ulundi, and there are asbestos mines in the neighbourhood. It was besieged for a time by the Zulus during the Zulu War of 1879. Here Cetywayo died in 1884. Pop. 52,929.

**Esk.** River of Great Britain. Formed by the confluence of the Black Esk and White Esk, which meet in Eskdalemuir, it flows for 35 m. through Dumfriesshire and Cumberland to the Solway Firth, about 5 m. below Longtown.

**Esk.** River of Cumberland, England. It rises between Scafell Pike and Rossett Crag and flows about 15 m. generally S.W. through Eskdale to reach the Irish Sea at Ravenglass. The Forestry Commission in 1945 proposed to form a national park in Eskdale.

**Esk.** River of the N. Riding of Yorkshire, England. Rising to the

N. of Burton Head, it flows N. and then generally E. across Cleveland, through beautiful woodland scenery, for some 20 m., entering the North Sea between high cliffs at Whitby.

**Esk.** River of Midlothian, Scotland. It is formed by the junction of the N. Esk and S. Esk in Dalkeith Park, flowing thence to the Firth of Forth at Musselburgh.

**Esk, NORTH.** River of Kincardineshire and Angus, Scotland. It is formed by the junction of the Lee and Mark, which unite at Invermark, and flows S.E. for 29 m. to the North Sea,  $4\frac{1}{2}$  m. N.N.E. of Montrose.

**Esk, SOUTH.** River of Angus, Scotland. It rises in the Grampian Mts. above Glen Clova, and flows 49 m. S.E. and E. to the North Sea at Montrose.

**Esker** (Irish *eskar*). Long, winding ridge of coarse gravel and sand. Formed by torrents of water released from glaciers, eskers are situated in areas formerly occupied by ice-sheets.

**Eskestuna.** Town of Sweden, in the prov. of Södermanland. It stands on the Hjelm river, between the Mälär and Hjelm lakes, 65 m. by rly. W. of Stockholm. Known as the Sheffield of Sweden, it has iron-foundries, steel works, a royal arms factory, and a technical school. It is celebrated for its cutlery and damascened work. Named after S. Eskil (d. 1181), the English apostle in Södermanland, its 12th century monastery was destroyed by fire in 1680. Pop. 45,245, the ninth town in Sweden.

**Eskimo** (Abenaki, raw flesh-eater). Primitive race inhabiting Arctic America. Numbering perhaps 30,000, they have a geographical range of 5,000 m., the widest of any aboriginal race in the world. The Danish form Eskimo has displaced the French Esquimaux. The Hudson Bay "husky," used of man and dog, is a colloquial variant. The native name is Innuvit (men). Long-headed, broad-faced, lank-haired, and of a yellowish brown colour, they may have originated in prehistoric Europe. Besides their seal-food, they still hunt musk-ox and reindeer. Their bone arrow-heads, harpoons, shaft-straighteners, and ornaments, their stone lamps and ivory engravings—almost reaching picture-writing—support this view, which, however, has recently been contested in favour of relationships more definitely mongoloid. That they crossed by the Bering Strait is undisputed, so that a pre-American

habitat in N. Siberia is a reasonable inference. The claim that they extended at one time to the Scandinavian, and even to the N. coasts of Britain, is less fully established. Their one-man skin canoes (kayak), transport boats (umiak), summer tents of skin, winter huts of turf stone, migrant snow-houses (igloo), harpoon floats, dog sledges, cairn-burials, all show intelligent adaptation to adverse conditions.

The language-stock, with its many dialects, attests a long ancestry, anterior to their American advent. Their animism embraces a crude magic, governed by medicine-men (angakok), akin to African witch-doctors rather than Siberian shamans. Their communal life recognizes no national chiefs; tribal warfare is unknown. Their ample folklore points to a belief of some tribes in a woman of the sea, perhaps Scandinavian, of others in a moon-god. The Aleuts of the Aleutian Islands are a self-contained branch of the race, exhibiting traces of Asiatic rather than American Indian contact. A tribe of blond Eskimo was discovered by Stefansson during his 1909-11 expedition on Coronation Bluff, far in the Arctic Zone. See *Aborigines*.

**Bibliography.** The Central Eskimo, F. Boas, 1888; The People of the Polar North, K. Rasmussen, compiled from the Danish by G. Herring, 1908; The Labrador Eskimo, E. W. Hawkes 1916; Eskimo-Land Speaks, W. van Valin, 1945.

**Eskimo Dog.** Breed of dogs kept by the Eskimos of Arctic America. They are little more than domesticated wolves of the region. The practice of crossing



Eskimo man in  
hunting dress



Eskimo Dog. Specimen of the  
breed, closely akin to the wolf

the females with wild wolves tends to check those modifications which domestication produces. The Eskimo dog has a sharp muzzle, upright ears, rough coat, and a bushy tail. Though usually of the colour of the wolf, black-and-white specimens are not uncommon. Like the wolf, it does not bark, but howls. The dogs are fed on frozen fish, but in spring often find birds and eggs. Their usual drink is snow. They are employed for sledge drawing, about eight being yoked together. When the going is good a dog will draw on an average over 300 lb. for 35 m. in a day. See Dog colour plate.

**Eskishehr** or **ESKISEHIR** (Turk., old city). Fifth town of Asiatic Turkey, the ancient Dorylaeum. This capital of a vilayet with the same name, with its rich deposits of meerschaum and trade in pipes in that material, stands on the Pursak Su. It is the junction at which the main rly. from the Bosphorus divides into two, one branch going E. to Ankara and the other S.W. to connect on the W. with the Izmir rly. and on the E. with the Bagdad rly. The town has sulphur springs (122° F.). The battle of Dorylaeum, July 1, 1097, was a notable victory for the Crusaders over the Turks. Pop., town, 80,096; vilayet, 206,794.

**Esla**. River of Spain. It rises on the S. slopes of the mts. of Asturias, in the N. part of the prov. of Leon, and flows a generally S.S.W. course to discharge its waters into the Douro, 16 m. W. of Zamora. It has a length of 120 m.

**Eslava**, MIGUEL HILARION (1807-78). Spanish composer. Born near Pampeluna, Oct. 21, 1807, he became master of the choir in Ossuña cathedral in 1828. He moved to Seville in 1832, and was appointed *maestro* at the cathedral, and to a similar position at the court of Isabella in 1844. He died at Madrid, July 23, 1878. He wrote three operas, *El Solitario*, 1841; *Las Treguas de Tolemáida*, 1842; *Pedro el Cruel*, 1843; and about 150 masses and pieces of ecclesiastical music.

**Esmarch**, JOHANNES FRIEDRICH AUGUST VON (1823-1908). German surgeon. Born Jan. 9, 1823, at Tönning, Schleswig-Holstein, he served in the wars of 1848 and 1864, and, in the Franco-Prussian war, 1870-71, was surgeon-general to the army. He specialised in hospital management and military surgery. He invented an indiarubber bandage for field work and temporary dressing. He died at Kiel, Feb. 23, 1908.

**Esmeraldas**. Maritime dept. of N.W. Ecuador, lying S. of Colombia. The surface is broken and hilly, but there are the open pasture valleys of the Esmeraldas, Cayapas, and other rivers. The hills are heavily forested, yielding many kinds of timber, also tobacco. Although the mineral resources have not been largely exploited, gold and platinum are found. Area, 5,464 sq. m. Pop. 58,950. Esmeraldas, the capital, is a Pacific port at the mouth of the Esmeraldas, 96 m. N.W. of Quito. It manufactures tobacco and exports rubber, cacao, sugar, fruit, and cattle. Pop. 4,000.

**Esmond**, HENRY. Central character in Thackeray's novel of the same name. Its full title is *The History of Henry Esmond*, a colonel in the Service of Her Majesty Queen Anne, Written by Himself. Published in 1852, it is a masterly presentation of early 18th century life and manners; the illusion as to its having been written by a man of the very time with which it deals is brilliantly sustained. The hero tells his own story from boyhood. It not only includes an account of the campaigns of Marlborough, but introduces the finely conceived character of the wayward Beatrix, most imperious of mistresses, true to her period and fascinating for all time.

**Esmond**, HENRY VERNON (1869-1922). Stage and pen name of Henry Vernon Jack, British dramatist and actor. He was born at Hampton Court, Nov. 3, 1869, was educated privately, and went on the stage in 1885. He was the author of many plays, some of which enjoyed considerable popularity: *Bogey*, 1895; *One Summer's Day*, 1897; *The Wilderness*, 1901; *Under the Greenwood Tree*, 1907; *A Young Man's Fancy*, 1912; above all, *Eliza Comes to Stay*, 1913 (previously called *Sandy and His Eliza*); *The Dangerous Age*, 1914. He died April 17, 1922.

**Esneh** or **ESNA**. Town of Egypt. It is on the left bank of the Nile, 36 m. by rly. above Luxor. It is identical with the *Tesnet* of ancient Egypt, but was called *Latopolis* by the Greeks, after the locally venerated *latos* fish. The chief object of interest is the temple of Khnum, which was embellished by Roman emperors from Titus to Decius (251). A subterranean Coptic church was identified here in 1895. The barrage at Esneh ensures irrigation for a large tract of land.

**Espagnols-sur-Mer** (Fr., Spaniards on the sea). Name given

to a sea fight that took place off Winchelsea between the English and the Castilians, Aug. 29, 1350. The two peoples were not actually at war, but the Castilians had helped the French in the war then raging. Moreover, acts of piracy had been committed on both sides.

The sequel was an attack on a Castilian fleet of armed merchantmen as it was returning from the Netherlands to Spain. Under the command of Edward III the English fleet was assembled at Winchelsea, and there the Castilians, nothing loth, joined battle with them. This was rather an encounter of soldiers than of sailors. Crossbowmen on the Castilian ships did much execution, and as the English and Castilian ships lay side by side, the crews fought hand to hand. In the cog *Thomas*, King Edward and his nobles took a gallant part, and this ship was sunk just as the royal party had boarded an enemy vessel. Forty or fifty ships were engaged on either side, the Castilians being the larger. Night, rather than a decision, put an end to the combat, which is described by Froissart.

**Espalier** (Fr.). Shape or form of fruit-tree which has been trained from its earliest or budded



Espalier. Pear tree trained to grow in this way upon a trellis

stage. An espalier consists of a main root stem, the original stock, from which fruit branches in tiers extend horizontally right and left, one above another. During the year after budding, when the side-shoots make their appearance, all should be removed except three, which should be grouped close together. One of these shoots is trained upwards to form a continuation of the main stem, and the remaining couple are coaxed by sticks and strings to grow right and left, parallel with the surface of the ground. When the main stem produces three more buds suitably situated the process is repeated at a distance of about one foot above the original tier. The

word seems to have originally denoted the trellis-work on which the trees were trained.

**Espartero**, BALDOMERO (1792-1879). Spanish soldier and statesman. Born Feb. 27, 1792, at Graná-



B. Espartero,  
Spanish soldier

átula, Ciudad Real, of humble parentage, he fought against Napoleon in Spain, and afterwards against the rebels in S. America. Again in Spain, he obtained several

successes against the Carlists, and in 1839 concluded the treaty of Vergara which ended the wars. Turning to politics, he became prime minister, and during 1841-43 was regent, but he fell from power and passed the next few years as an exile in England. Pardoned, he returned to Spain in 1848, and during 1854-56 was again premier. In 1868 he was put forward as a candidate for the throne, and later was made prince of Vergara. He died Jan. 9, 1879.

**Esparto Grass** (*Stipa tenacissima*). Tall perennial grass of the family Gramineae. It is a native

of S. Europe and N. Africa, where it grows in rocky soil. Its leaves are rolled in from the edges, so that they appear threadlike. Being tough and wiry, it is used in the manufacture of ropes, mats, and a durable kind of paper. For the latter purpose many thousands of tons of the grass were before the Second Great War imported into Great Britain annually. As a crop it yields about 10 tons per acre. See Paper.



Esparto Grass

**Esperance**. Harbour of W. Australia. It is situated on the S. coast, 220 m. N.E. of Albany. Gold from Coolgardie is shipped from here.

**Esperanto** (Span. *esperanza*, hope). International auxiliary language originated by Dr. L. L. Zamenhof of Warsaw (1859-1917), and developed by 60 years' worldwide use. The first book was published in 1887. In the first 30 years Esperanto met with indifference, criticism, and active opposition arising mainly from ignorance of the language and its aims. Then came steady progress,

until Esperanto was known and used to some extent in most civilized countries.

There are textbooks in some 80 languages, and 60 Esperanto periodicals are published. There is a flourishing literature, both original and translated: the catalogue of the British Esperanto Association library has over 10,000 entries. Among international language schemes Esperanto leads the field in the number of adherents, practical use, and extent of literature. This is partly because, on an unchanging basis, it is free to develop in any way shown by life and experience to be desirable. Esperanto is easily learned; every rule is without exception, the spelling is phonetic, and the vocabulary (consisting of the commonest European roots) surprisingly small. In structure, the language is not inflected, but agglutinative, which helps to account for its success in countries like Japan.

The following are the terminations of words: -o, noun; -a, adjective; -j (*pron.* like English *y*) plural; -n, objective (accusative); -e, adverb; -i, infinitive; -u, imperative; -as, present tense; -is, past; -os, future; with similar terminations for active and passive participles. 35 affixes are employed to form derivatives: e.g. -il, instrument (*haki*, hew, *hakilo*, axe); -ist, habitual occupation (*boto*, boot; *botisto*, boot-maker). Compounds are formed by combining roots: *domo*, house, *besto*, animal, *dombesto*, domestic animal. There is a table of correlative words—demonstrative, indefinite, universal, negative, and relative.

International congresses have been held yearly (except in wartime) since 1905. Control is by an international language committee of 100. National societies exist in most lands for local propaganda. All unite for common purposes in a central International Esperanto League (headquarters in 1947 at Heronsgate, Rickmansworth, Herts).

Esperanto is taught in schools and colleges, for its own sake, as a means of acquiring a better knowledge of grammar, and as an approach to the study of other languages. In England demonstration lessons are given in a hundred schools yearly. It has been used in international radio, though not by the B.B.C. It has government support in various countries, e.g. in Brazil. The headquarters for the British Empire is The British Esperanto Association, Inc., 140,

Holland Park Avenue, London, W.11. Consult *The Language Problem*, E. D. Durrant, 1943.

**Esperanza**, LA. Town of Honduras, capital of the dept. of Intibuca. It stands on a plateau at an alt. of nearly 5,000 ft. above sea level, 45 m. W.N.W. of Tegucigalpa. The Indian city of Intibuca is adjacent.

**Espinal**. Town of Colombia, in the dept. of Tolima. It stands at an alt. of 1,020 ft., 25 m. N. of Purificación, and 75 m. S.W. of Bogotá. It is the centre of an agricultural district, producing coffee, cocoa, and tobacco, and manufactures pottery.

**Espionage** (Fr. *espion*, spy). Clandestine collection of information. Espionage may be of a private character to obtain information regarding the conduct of an individual or the progress of a business transaction, such transactions generally being in the hands of a private detective. Political espionage is frequently practised by governments to keep them informed of the activities of their political opponents and to acquaint them with the state of public opinion. A network of secret police and internal espionage is essential to dictatorships for the suppression of criticism or acts threatening the stability of the regime.

The term most commonly refers to the organized employment of secret agents by governments to obtain information concerning other countries, particularly relating to military strength and war potential, which cannot be obtained by open methods. Espionage is conducted by three types of spy: the person who spies for his country from patriotic motives; the traitor who sells his country's secrets for political reasons or for monetary gain; and the person of doubtful character and any nationality who is ready to undertake anything in order to earn money rapidly.

Spies caught in wartime are tried by civil or military courts and generally sentenced to death. In peace heavy penalties of fine and imprisonment are imposed. Attempts have been made at international conferences, notably at Brussels in 1874 and The Hague in 1907, to arrive at a proper definition of spying and a uniform code of rules for its suppression. Conferences drew up a scale of procedure for the trial and punishment of spies, but not all countries accepted the recommendations or observed them in war.



Military espionage is almost as old as warfare; instances occur in the Bible and spies are mentioned by classical authors such as Xenophon and Caesar. Espionage became highly organized in the 17th century in England under Cromwell and in France under Richelieu. Frederick the Great employed spies, and Napoleon's system reached great efficiency under General Savary. Under the direction of Stieber, the 19th century Prussian spy organization prepared the way for the campaigns preceding the establishment of the German Empire. Its work facilitated the triumphal march of the Prussians to Sadowa in 1866, and at the outbreak of the war with France in 1870 the Germans had 30,000 spies behind the French lines. Japanese victory over Russia in 1905 was due in great measure to the large number of Chinese spies working for Japan in Manchuria.

Espionage was practised on a large scale by all belligerents in the First Great War. The Germans were helped by the large numbers of their nationals settled in foreign countries, the eastern departments of France being riddled with German agents. Neutral countries became clearing centres for spies employed by all belligerents. One of the most notable spies employed by Germany was the Javanese woman, Mata Hari, who was caught by the French and shot at Vincennes. Carl Lody, a German ex-officer caught spying in England, was shot. At the outbreak of the Second Great War, Germany had an even more intricate network of espionage operating throughout the world, often working in cooperation with Fifth Column (*q.v.*) organizations. Great Britain during the war sentenced to death 16 spies: four each British, German, and Belgian, three Dutch, and one Portuguese.

**Espirito Santo.** Maritime state of S.E. Brazil. It is bounded N. by Bahia, W. by Minas Geraes, E. by the Atlantic, and S. by Rio de Janeiro. Hilly in the interior and on the W., where run the Serra dos Aimores and the Serra do Mar, elsewhere it is level, and in parts marshy. Well watered by the Rio Doce and its tributaries, it produces coffee, sugar, cocoa, tobacco, rice, and salt; its forests yield valuable timber and drugs. The Parahyba do Sul flows along the S. boundary. The mining resources of this region are not yet tapped, but deposits of iron ore are known to exist. Three rlys. serve the state.

The capital is Vitoria, on the bay of Espirito Santo. The first Portuguese settlement was made in 1535. Area 17,308 sq. m. Pop. est. 851,000.

**Espirito Santo.** Largest and westernmost of the New Hebrides, Pacific Ocean, in lat. 15° S., long. 167° E. It is 65 m. long by 20 m. wide, and mountainous, attaining an altitude of over 5,000 ft. Maize, coconuts, millet, coffee, and bananas are grown. Trade is mostly with Sydney. The island was an Allied naval base in the Second Great War. Area, 1,850 sq. m.

**Esprit des Lois, DÉR'.** Title of a great work by Montesquieu. It is divided into 31 books, each of which contains a number of short chapters, some only a few lines in length, and made a big quarto volume. Published anonymously at Geneva in 1748, it has been many times reprinted. It is a comprehensive survey of the nature of laws and government "almost unique in its entire freedom at once from doctrinairism, from visionary enthusiasm, from egotism, and from an undue spirit of system." Its contents may be expressed by its sub-title, "the relation which laws should have to the constitution of every government, to manners, climate, religion, commerce, etc."

**Espronceda, JOSÉ DE** (1808-42). Spanish poet. Born March 25, 1808, near Almedralejo, Estremadura, he was educated at the college of S. Matthew, Madrid, and before the age of 15 was imprisoned as a member of a revolutionary secret society. On returning to the capital he found himself suspect, and after a further spell of incarceration escaped to England. In London he studied Shakespeare, Milton, and Byron (by whom he was most markedly influenced), and while there wrote his fine ode *A la Patria* (1829). In 1830 he was in Paris, fighting in the brief revolution there. On the amnesty after the death of Ferdinand, 1833, he returned to Spain and entered the queen's bodyguard, but was cashiered for writing a political song. Journalism, novel-writing, and various revolutionary movements occupied him for a few years, and in 1841 he became secretary of the embassy at the Hague. In 1842 he returned to take his seat in the cortes as deputy for Almeria. He died May 23, 1842.

Showing early gifts as a poet, he gained a leading position among 19th century Spanish writers, and his influence on his successors was

marked. His best work was of a lyrical and self-revealing character, as is seen in the Don Juan-like narrative, *The Student of Salamanca*, and the Faust-like *The Devil-World*. See Spain: Literature; consult also *History of Spanish Literature*, J. Fitzmaurice-Kelly, 1898.

**Esquiline Hill** (*Mons Esquilinus*). The highest of the "seven hills" on and around which ancient Rome was built. Lying between the Caelian and the Viminal, in the original city it was regarded as including the Oppian, Cispian, and Fagatal. On the Esquiline were the Colosseum (*q.v.*), on the site of the Golden House of Nero, and the *thermae*, or warm baths, of Titus and Trajan. See Rome.

**Esquimalt.** Port of British Columbia, Canada. It is on Vancouver Island, 3 m. from Victoria. It has a magnificent harbour and is the Pacific coast headquarters of the Canadian navy, with one of the largest dry docks in the world. There is a dockyard and other naval establishments. The town is served by rlys. The industries include shipbuilding and oyster culture. Pop. 3,128.

**Esquire** (old Fr. *escuyer*, shield-bearer). Title of honour. The word, originally denoting one who bore the shield for a knight, became a title of honour below the rank of knight. Among those legally esquires are sons of peers, the eldest sons of baronets and knights, justices of the peace, and barristers. All men except those possessing a title by status or rank are in practice addressed in writing as esquire (abbreviated Esq.). An American magazine of this name was first published in Chicago in 1933.

**Essad, AHMET, PASHA** (1863-1920). Albanian soldier and politician. Descended from the Top-tani family, hereditary claimants to the Albanian kingship, Essad entered the Albanian army, served in Macedonia and Albania on the side of Turkey, and was rewarded for services against Greece, 1897, with the title of pasha. The assassin of Essad's brother, hired by Abdul Hamid, was slain by Essad, but soon after the sultan made him commander of *gendarmérie* at Janina.

In 1908 Essad headed the deputa-tion which announced to Abdul his deposition, and in the Balkan war of 1912 heroically defended Scutari against the Greeks. During the short reign of Prince William of Wied as mpret, Essad was the real ruler of Albania and

attempted an abortive *coup d'état*, was arrested but released, and after the mp̄ret's departure made himself head of the provisional government, Oct. 5, 1914.

In Jan., 1916, he sided with the Allies. In Feb. the Austrians overran Albania, and Essad escaped to Salonica. His connexion with the Serbians, whom he had aided in their 1915 retreat, made him distasteful to the Italians who occupied Albania after the Austrian retreat, 1918, and he was not allowed to return there. He lived for some months in Paris, and was murdered by an Albanian student, June 13, 1920. *See* Albania.

**Es Salt.** Village of Transjordan. Identified as the ancient Ramoth (Deut. iv, 43; Josh. xx, 8), it is 15 m. N.E. of the crossing of the Jordan at El Ghoraniyeh, 20 N.E. of the N. end of the Dead Sea. Situated at an elevation of 2,740 ft. above the sea, it is the capital of the Kadā (division) of El-Belkā. Wine and raisins are produced in the district. The inhabitants are two-thirds Moslems, the rest Greeks, Protestants, and Roman Catholics. During the First Great War it was a depot of the Turks, who when they retired from it, April 1, 1918, brought away some thousands of Jewish, Syrian, and Armenian refugees. On April 30 Allenby resumed operations E. of the Jordan, and Australian mounted troops entered Es Salt. It was evacuated May 3, when Allenby withdrew his whole force to the Jordan crossings. *See* Palestine, Conquest of.

**Essay** (Fr. *essai*, attempt; Lat. *exigere*, to examine). Literary composition, generally in prose, of a short and informal character. The origin of the word is the same as that of assay, for at first it was taken as indicating a testing or trying of a subject. The word has, however, at different times been applied to a great variety of compositions, embracing at once the sententious brevities of Bacon and the fullness of such a philosophical work as that of Locke, On the Human Understanding. It is also applied to certain of the didactic poems of Pope.

Montaigne (16th century) is generally regarded as the originator of the modern essay, as he was the first to employ the word as title for his pleasantly discursive and personal writings; yet, as Bacon, the earliest notable master of the English essay, wrote, "the word is late, but the thing is ancient." Bacon's Essays, 1597, are mainly a succession of pithy maxims, and differ greatly from the essay as it was evolved during the succeeding centuries; for it was rather from

the Frenchman than from their countryman that the English essayists derived. Ignoring its use as something of an apologetic prefix to philosophical and historical studies, and its employment in poetry by Pope and some of his imitators, the history of the essay in English literature may be followed in a record of some of its exponents.

Abraham Cowley, the first English author to write in the easy, familiar, personal style of Montaigne, though he frequently rounded off his essay with a poem on its theme, or wrote the essay as little more than introduction to a poem, may be called the father of the familiar essay in English. It was with Richard Steele and Joseph Addison that the essay established itself as a popular form of literary composition. Their personal studies in essay form in *The Tatler* and *The Spectator* are regarded as adumbrating the English novel; as two laughing philosophers, with their genial comment on men and affairs in periodical essays, they established a form of the composition which continued throughout the 18th century.

In the hands of Daniel Defoe early in that century, the periodical essay received that particular bent out of which developed the newspaper leader. Towards the middle of the century the periodical essay was revived in *The True Patriot*, *The Rambler*, *The Covent Garden Journal*, *The Adventurer*, *The Idler*, *The Bee*, *The Citizen of the World* and many more, and found its most notable writers in Henry Fielding, Samuel Johnson, and Oliver Goldsmith. These various works were brought together in *British Essayists*, with prefaces by A. Chalmers, 45 vols., 1817.

With the 19th century the essay branched more definitely into two main kinds, both already, but less distinctly, differentiated, the familiar and the critical essay. Of the writers of the former kind the greatest exemplar is Charles Lamb, whose *Essays of Elia*, 1823, *Last Essays of Elia*, 1833, and uncollected essays may be said to have influenced many of his successors up to the present day. At the same period William Hazlitt was writer of essays of a more robust character, and Leigh Hunt was master of a dainty, graceful essay style, less charmingly individual than that of Lamb. The critical essay received a stimulus from the establishment of the quarterly reviews and the rapid growth of the magazines, Francis Jeffrey, Sydney Smith, and Thomas Babington Macaulay being among its most notable exponents.

Bulwer Lytton, W. M. Thackeray, J. A. Froude, Matthew Arnold, all favoured the essay form at times, but names that come more readily to the mind today in thinking of English essayists are R. L. Stevenson, Austin Dobson, Augustine Birrell, Alice Meynell, A. C. Benson, E. V. Lucas, Hilaire Belloc, G. K. Chesterton, Robert Lynd, A. A. Milne, J. B. Priestley, Aldous Huxley, and notably that charming exponent of the form, Violet Paget, famous as "Vernon Lee." Among later English writers who are essayists rather than literary critics, George Orwell is outstanding. In America, Ralph Waldo Emerson has been the most eminent essayist, though Oliver Wendell Holmes, James Russell Lowell, Hamilton Wright Mabie, Agnes Repplier, Paul Elmer More, should be mentioned. H. L. Mencken and many other of his contemporaries have practised the essay with distinction.

**Essay on Man**, AN. Moral poem by Alexander Pope. It takes the form of four epistles to Lord Bolingbroke, who is supposed to have suggested the theme, and was published anonymously in 1732-34. Though it has been objected that the author was hampered by the metaphysical nature of his subject, and gives no consistent scheme of beliefs, the Essay will always be remembered for the many terse sentences it has added to the great body of familiar quotations.

**Essays and Reviews**. Volume by seven writers, six of them clergymen of the Church of England. On its publication in 1860, its rationalistic tendencies aroused a storm of criticism. Two of the clergymen—Williams and Wilson—were suspended by the ecclesiastical courts, but the suspension was revised on appeal to the Privy Council, when, as it was said, Lord Chancellor Westbury "dismissed eternal punishment with costs." The contents of the volume were: *The Education of the World*, Frederick Temple; *Bunsen's Biblical Researches*, Rowland Williams; *On the Study of the Evidences of Christianity*, Baden-Powell; *The National Church*, H. B. Wilson; *The Mosaic Cosmogony*, C. W. Goodwin; *Tendencies of Religious Thought in England, 1688-1750*, Mark Pattison; and *The Interpretation of Scripture*, Benjamin Jowett.

**Essays of Elia**. Volume of familiar papers on various themes by Charles Lamb, published in volume form in 1823 after appearance in *The London Magazine*, and supplemented in 1833 by the *Last Essays of Elia*. These essays, varying from grave to gay, pervaded

with delightful fancy and rich in humour and tenderness, reveal much of the life and character of the author. They not only include the best of Lamb's work, but stand alone and unchallenged as the supreme collection of familiar essays in the English language. *Pron.* Ellia. *See* Lamb, Charles.

**Essen.** City of Germany. It lies 20 m. N.E. of Düsseldorf, and is the main centre of the Ruhr industrial area.



Essen arms

Seat of the original Krupp armament plants (demilitarised in 1946), of Germany's chiefmining companies, and of nearly 7,000 other industrial enterprises with, together, some 200,000 workers and employees, Essen's growth was phenomenal: from 57,000 in 1880 to 659,871 in 1939. During the Second Great War the city was almost destroyed by bombing. It was a principal rly. and canal shipping centre, and, around the old and the industrial towns, had developed spacious suburbs. Villa Hügel, the Krupp mansion, was famous; and there existed remarkable remnants of the old town, such as the minster church, built in 852 (which largely survived the bombing), and in the suburb of Werden a Benedictine church also of the 9th century.

Modern buildings of merit included the stock exchange, Folkwang museum, banking and business palaces, schools, etc., and model settlements and welfare institutions. Essen arose as a Benedictine nunnery in the 10th century, was first mentioned as a town in 1003, and, under a princess-abbess, was protected by the counts, later dukes, of Jülich-Cleves-Berg. Inherited by Brandenburg electors, it was secularised 1803, became Prussian in 1814, and the centre of French Ruhr occupation in 1923. Taken by troops of the U.S. 9th army, April 9, 1945, it was included in the British zone of occupation in Germany. *See* Krupp.

**Essen, HANS HENRIK, COUNT** (1755-1824). Swedish soldier and statesman. Born in West Gothland, Sept. 26, 1755, and educated at Uppsala, he entered the army. He became a favourite of Gustavus III, whom he accompanied in the war against Russia, 1788-90, and whose assassination he witnessed in 1792. In 1795 he was appointed governor of Stockholm. From 1800

to 1807 he was governor-general of Pomerania and distinguished himself by a stubborn defence of Stralsund against the French. In 1810 he negotiated a peace with France by which Pomerania was restored to Sweden and in 1811 was promoted field-marshal. In 1813 he commanded the successful expedition against Norway, and was governor there, 1814-16. He died at Uddewalla, June 28, 1824.

**Essence** (Lat. *esse*, to be). The sum of the permanent, constitutive qualities which make an existing thing what it is. The name quintessence (fifth essence) was given by Aristotle to ether, the other four being fire, water, earth, air. Essence is now used to denote the best and purest part of anything. As a theological term, essence or substance (*ousia*) is used of that which is common to the three Persons of the Trinity, in contrast

**Essenes.** Ancient Jewish sect. It sought to combine the ascetic practices of the Jewish religion with various Oriental tenets and rites. Probably an offshoot of the older sect of the Chasidim or Assideans, it would appear to have originated in the days of the Maccabees (2nd century B.C.). The Essenes believed in one God and in eternal predestination. While maintaining the immortality of the soul, they denied the resurrection of the body; and they held a Greek view of future rewards and punishments. Strongly opposed to an official priesthood, they refused to take part in the Temple sacrifices, but held ceremonial feasts with prayer in their own houses. They led very austere lives, some living in community under a kind of monastic rule, while others lived apart in contemplative solitude. Community



Essen. This important industrial city of Germany was severely damaged in the Second Great War by Allied bombing. Among factories put out of action were the Krupp works, of which a section is shown in this air view

with *hypostasis* (person), which refers to the special characteristics of each Person.

**Essence.** Strong flavouring used in puddings, cakes, and sweets. It is made by extracting or distilling the volatile oil from plants, seeds, or kernels, such as vanilla, coriander, musk, anise, nutmeg, peppermint, and coffee. Ratafia is prepared from bitter almonds and other kernels and orange peel. Essence of rennet is made from the stomach of the calf, and when poured into milk produces curds. Beef essence or extract is used in the making of gravies, and also as a stimulant for invalids. *See* Essential Oils.

of good was practised, and the time was divided between prayer, study of the sacred books, and agriculture.

Later, becoming tainted with the Gnostic tenets of the essential evil of matter and the dualistic origin of the universe, they abstained from flesh, wine, and marriage. They paid peculiar reverence to certain angels, and sometimes practised a form of sun worship. Strongly opposed by orthodox Jews, though favoured by the Herods, they were cruelly persecuted by the Romans. They had a settlement near the Dead Sea; Josephus estimated the stricter Essenes of his day at

about 4,000. The sect died out before the 3rd century. *Pron.* Es-seenz. See Jews.

**Essential Oils.** These oils, sometimes known as volatile oils, almost exclusively of vegetable origin, possess in concentrated form the odour of the plant parts from which they are derived. Oils in this group are readily obtained by distillation or other means from the flower petals, macerated leaves, grasses, stems, and fruit rind of members of the great botanical families Coniferae, Compositae, Labiatae, Lauraceae, and others. The most important and familiar oils in this group are those of peppermint, eucalyptus, cinnamon, clove, lavender, camphor, citronella, and turpentine. The main centres of production are the south of France, countries bordering the Mediterranean Sea, S.E. Europe, French African colonies, East Indies, India and Ceylon, and, for pine oils, Russia, the U.S.A., and Canada.

#### Sources of Important Oils

Different oils concentrate in different parts of plants, which thus serve as raw materials. From the rind of the fruits of various citrus plants, lime, lemon, bergamot, and orange, oils are obtained; from berries are derived juniper and pimento oils; from flowers, lavender oil. Ripe seeds of species of culinary herbs are the source of the food flavouring oils of celery, caraway, marjoram, sage, thyme, fennel, and anise. The needles and cones of various conifers—firs, pines, larches, and spruce—yield pine-needle oils. Eucalyptus oils are derived from the leaves and terminal branches of the many species known to Australians as blue gums, which comprise in their 300 species 75 p.c. of the vegetation of Australia. Orris and ginger are produced from rhizomes; clove oil from immature flower buds; angelica and vetivert oils from roots; the whole dried plant is used for peppermint oil; of the camphor tree every part is utilised in making camphor and camphor oil.

Essential oils and other naturally occurring perfumery raw materials are now obtained from crops so widely scattered over the world that new crops become available every month of the year. Thus in March the violet, clove, and Bourbon geranium are available; in Sept., aniseed, jasmine, Ceylon citronella, English lavender, English and American peppermint, spearmint, French geranium.

Chemically, essential oils consist largely of hydro-aromatic

hydrocarbons, known as terpenes, and are of the empirical composition  $C_{10}H_{16}$ ; associated with these terpenes are their many alcoholic, aldehydic, ketonic, and ester derivatives, and it is to these secondary constituents that an oil frequently owes its aroma. Practically all essential oils are liquids, of boiling point around 160°–180° C., generally insoluble in water but freely soluble in alcohol, ether, and other common organic solvents, and in fats and fatty oils.

Some essential oils are obtained by solvent extraction of the raw material, but the commonest method is to make use of the property of volatility in steam common to all. Dry, chopped up, or macerated raw material—grasses, berries, leaves, bark, etc.—is placed in stills and steam passed through the mass. The still may hold tons of material; reduced pressure may be resorted to, and the steam which passes through is condensed and subsequently the oil separated from the resultant water mixture. The oil yield varies from less than 1 p.c. of the raw materials treated for pine-needles and many grasses, to 17 p.c. for bay leaves.

#### Methods of Extraction

Oils of the citrus group are best obtained by expression, usually in small hand-operated presses, from the fruit rind. West Indian lime oil, however, is generally distilled from the rind of the fruit. For jasmine, orange flowers, tuberose, and some other flower oils, enfleurage is preferred in the south of France: here the flower essence is absorbed by a thin coating of fat on which the flowers are placed. American, French, and Russian pine oils are obtained as an exudation from the bark of the tree, such oils on distillation yielding turpentine and a solid residue of colophony or rosin, the last being used in the soap, varnish, and paper-making industries.

However obtained, many of these oils, notably the floral ones, are used in general perfumery purposes, soap, and cosmetics. Eucalyptus and juniper have medicinal and pharmaceutical applications. Anise and caraway are used in cordials and liqueurs, while lemon, lime, orange, peppermint, and anise find application in flavouring. Some essential oils have germicidal properties, e.g. oil of thyme, eucalyptus, and pine-needle oils, the latter often in antiseptic sprays and inhalants. Some species of eucalyptus and

pine oils help in the modern froth-flotation method of treating mineral ores.

#### Uses of Essential Oils

A word must be said about essential oils as the raw materials for the manufacture of chemical substances important in the perfumery and flavouring industries. Safrol, present in oil of camphor and notably in oil of sassafras, can be converted by a series of operations into heliotropin, a white crystalline substance with an odour of the heliotrope flower. Citral, present to the extent of 75 p.c. and upwards in lemongrass oil, and also in small amounts in oil of lemon, can be converted into a class of substances known as ionones, which when diluted have the odour of violets and impart freshness, delicacy, and volatility to perfumes. From some pine oils can be obtained the terpene hydrocarbon pinene, which, by a series of chemical operations is converted into synthetic camphor. Turpentine, a thinner in the paint industry, can be converted into terpineol, a substance used in almost every compounded perfume and valued because of its stability and its pronounced lilac odour. Terpinolene, also derived as a by-product from turpentine, is used to make disinfectants, especially those of the spray type. Clove oil contains upwards of 85 p.c. of eugenol, to which the oil owes its odour. Large amounts of eugenol extracted from clove oil are converted into the crystalline flavouring material vanillin, which formerly could be obtained only from vanilla beans. The principal essential oils, and plant sources from which they are derived are the subjects of specific articles. See *Fixed Oils*; consult also *The Essential Oils*, H. Finckemore, 1926; *The Volatile Oils*, E. Gildemeister, 1926.

H. M. Langton, B.Sc., F.R.I.C.

#### Essential Work Orders.

The regulations issued by the Minister of Labour on March 7, 1941, to prevent loss of production, through unnecessary changes of job by workers in certain undertakings scheduled as being engaged on work essential to the prosecution of the Second Great War. In a scheduled undertaking the management's right to dismiss employees and employees' right to leave their employment, became subject to the written permission of a national service officer. Employees could be discharged only for serious misconduct, and any

employees absenting themselves without leave or reasonable excuse, or being persistently late, could be reported to an officer. At first these orders applied chiefly to industries directly engaged in making munitions, but later amendments extended control to all industries, and workers could be directed to specific industries. The orders were gradually relaxed after the war, and by 1950 the last (applying to agriculture and coal-mining) were abolished.

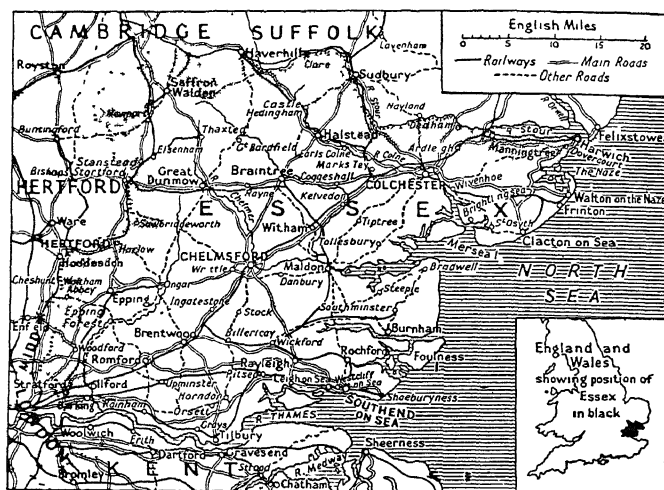
**Essequibo.** Settlement and river of British Guiana, S. America. The settlement extends to the Venezuelan frontier and borders on the Atlantic Ocean for 120 m. It contains locust trees, iron wood, ebony, greenheart, and other hardwood trees. It was the subject of rival claims, settled by the arbitration treaty of Feb. 2, 1897, between Great Britain and Venezuela.

The river rises near the equator, among the mountains on the Brazilian border, and flows N., entering the Atlantic near Georgetown through a long estuary, from 15 m. to 20 m. wide, containing several islands. Its length is about 600 m., only 40 m. being navigable to vessels of deep draught, owing to cataracts; its mouth is impeded by sand bars. The largest river of the colony, it receives important tributaries, e.g. the Rupununi, Masaruni, Cuyuni, and the Pólaro.

**Essex.** Agricultural and maritime county of S.E. England. It is bounded S. by the Thames, E. and S.E. by the North Sea, N. by Suffolk and Cambridgeshire, and W. by Hertfordshire and Middlesex. Its area is 1,530½ sq. m. Some 90 m. of seaboard, indented by

several estuaries, is marked by low-lying islands: Canvey, Foulness, Wallasea, Mersea, etc. The chief rivers are the Thames, Lea, Stour, Colne, Chelmer, Blackwater, Crouch, and Roding. While the coastal region is flat and marshy, there is comparatively high ground in the N.W. and centre, the highest points being reached at High Beech, Epping Forest (q.v.); Danbury, between Chelmsford and Maldon; and in the Langdon Hills.

The forest of Essex, known after the early part of the 14th century as the forest of Waltham, has dwindled to the present day Epping Forest, a public possession since 1882. Chelmsford is the co. town and seat of a bishop; Col-



Essex. Map of this deeply indented county, showing its relation to the London area

chester, Maldon, Saffron Walden, Romford, and Braintree are other towns, with Barking, Dagenham, Ilford, East and West Ham, in the London area. Harwich is the chief port. Southend-on-Sea, Clacton-on-Sea, Frinton-on-Sea, Walton-on-the-Naze, and Dovercourt are popular holiday resorts. Eight members are returned to parliament for the county, and 16 for individual boroughs.

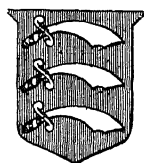
The county, described by Norden in 1594 as "fatte, fruteful, and full of profitable things," produces wheat, barley, and fruit. Apart from brewing (Romford) and engineering (Colchester), the manufacturing industries are largely confined to the metropolitan area, in which is the bulk of the population. The Crouch, Blackwater, and Colne have oyster beds; the Colchester oyster feast, an annual event (Oct. 20), dates from early times. There is a gunpowder factory at Waltham Abbey, and the Tilbury Docks and Victoria Docks (Plaistow) are on the Thames. Yachts and pleasure boats are built at Burnham-on-Crouch, a popular yachting centre.

In the 1st century B.C. Essex was the home of the British tribe of the Trinobantes. Later the kingdom of the East Saxons, it became the scene of many conflicts between Saxons and Danes. William of Normandy laid a heavy hand upon it. In the 12th century it gave its name to an earldom created by Stephen in favour of Geoffrey de Mandeville. From the 7th until the middle of the 19th century it was ecclesiastically attached to the see of London. It was next linked first to

Rochester and then to St. Albans. In 1914 the see of Chelmsford was founded. There are bishops suffragan of Colchester and Barking.

The county is rich in prehistoric, Roman, Anglo-Saxon, medieval, and monastic remains. It has many notable churches and some fine old houses, Audley End among them, while the remains of Norman castles, e.g. Colchester and Hedingham, and the fragment at Hadleigh, bear witness to the Norman occupation. The timberwork and thatching are notable. Essex is generally the driest county of England. An earthquake on April 23, 1884, damaged 1,200 houses between Colchester and the Blackwater. Pop. 1,755,459.

**LITERARY ASSOCIATIONS.** In Chigwell is the gabled King's Head Inn described as *The Maypole* in Dickens's *Barnaby Rudge*. The Rose Inn at Peldon and the marshes figure in Baring-Gould's *Mehalah*. Miss Braddon laid the scene of *Lady Audley's Secret* at Ingatestone. John Locke, philosopher, spent ten years and was buried at High Laver. John Ray, botanist, was born and died at Black Notley; Thomas Tusser, author of *Five Hundred Points of Good Husbandry*, 1573, was born at Rivenhall; Sydney Smith at Woodford, Isaac Taylor at Ongar; Francis Quarles near Romford. Dr. William Harvey was buried at Hempstead near Saffron Walden. More recently S. L. Bensusan wrote a series of tales and short stories about the marshlands. H. G. Wells lived for some years at Easton and described it as *Matchings Easy* in *Mr. Britling Sees It Through*; while



Essex arms

Arnold Bennett, residing at Thorpe-Soken, introduced Frinton in Mr. Prohack. The Victoria History of the co. was completed in 1907.

**Essex, EARL OF.** English title now held by the family of Capell. There were earls of Essex soon after



Walter Devereux,  
1st Earl of Essex  
From a portrait in  
the collection of  
Baron Bagot

the Norman Conquest, including Geoffrey de Mandeville (d. 1144). His sons followed him, after which the earldom came to the Bohuns. This family became extinct in 1373, when the title passed to

Thomas of Woodstock, duke of Gloucester, who had married one of the heiresses of the Bohuns. Henry Bourchier, a grandson of Gloucester, was the next earl, but his family died out in 1540. Thomas Cromwell was earl of Essex in 1540, and William Parr, marquess of Northampton, in 1543, but in both cases the title died with the holder.

The family of Devereux was related to the Bourchiers, and probably for this reason Walter Devereux (1541-76) was made earl of Essex in 1572. He married a daughter of Sir Francis Knollys, and spent three years in unsuccessful efforts to colonise Ulster, whither he went with a small army in 1573. He was succeeded by his son, the favourite of Queen Elizabeth, and with the death of the latter's son Robert, in 1646, the title became extinct.

In 1661 Arthur Capell was made earl of Essex. He was succeeded in 1683 by his son Algernon, and the title is still held by his descendants. In 1916 Algernon (b. 1884) became the 8th earl. The eldest son is known as Viscount Malden.

**Essex, ROBERT DEVEREUX, 2ND EARL OF** (1566-1601). English soldier and courtier. Eldest son of

the 1st earl, he was born at Netherwood, Herefordshire, Nov. 19, 1566, educated at Trinity College, Cambridge, succeeded his father in 1576, and was general of horse under his stepfather Leicester in the Netherlands, 1585-86, being knighted for gallantry at Zutphen.



Robert Devereux,  
2nd Earl of Essex  
After Hilliard

He continued Leicester's court feud with the party in which the Cecils and Raleigh were prominent, but became a favourite of the queen, though his lack of self-control led to quarrels, and his marriage with the widow of Sir Philip Sidney especially angered her.

Essex took part in Drake's expedition to Portugal, 1589, commanded an expedition to Normandy, 1591, secured the conviction of Roderigo Lopez for conspiracy against the queen's life, 1594, distinguished himself at the capture of Cadiz, 1596, lost favour by the failure of the Islands, or Cadiz Voyage, 1597, but was master of ordnance, earl marshal, informal foreign secretary to the queen, and chancellor of Cambridge. In 1599 he was appointed governor-general of Ireland, and, returning without leave from his attempt to suppress the rebellion of O'Neil, earl of Tyrone, with whom he was accused of making a dishonourable treaty, he was dismissed from office and imprisoned from Oct., 1599, to Aug., 1600.

Thwarted in his efforts to regain influence at court, and broken in health, he was implicated with Southampton and others in an attempt to secure the dismissal of the queen's advisers. He attempted a rising in London, was arraigned, and beheaded Feb. 25, 1601. Bacon, whom he had befriended, appeared against him on his return from Ireland, and with Raleigh was largely responsible for carrying out the death sentence, to which Elizabeth reluctantly consented. The story that the queen gave Essex a ring, the return of which would have ensured his pardon, is generally discredited, though what was described as the identical ring was sold at Christie's, May 19, 1911, for £3,412. Essex was fearless but headstrong, generous, a popular favourite, but utterly lacking in statesmanship. He was a writer of sonnets and masques.

**Bibliography.** Lives and Letters of the Devereux, Earls of Essex, W. B. Devereux, 1853; Bacon and Essex, E. A. Abbott, 1877; Elizabeth and Essex, G. L. Strachey, 1928; Life and Death, G. B. Harrison, 1937; The Unhappy Favourite, J. Banks, 1939.

**Essex, ROBERT DEVEREUX, 3RD EARL OF** (1591-1646). English soldier. Son of the favourite of Queen Elizabeth, he was restored in 1604 to the title his father had lost, James I being then on the throne. He was chosen as one of the companions of Henry, prince of Wales. In 1620 Essex went with a force

to recover the Palatinate for the elector Frederick, and in 1625 with the fleet that sailed to capture Cadiz.

In 1639 he held a command in the army sent by Charles I against rebel Scots in the first Bishops' War, after which there was an estrangement between him and the king. On the outbreak of the Civil War Essex took the side of the parliamentarians, and was appointed general of their forces. The earl led the army at Edgehill, relieved Gloucester, and fought the first battle of Newbury. He proved his incapacity when, after leading his army into Cornwall, he left it to surrender at Lostwithiel, himself escaping by boat. He resigned when the self-denying ordinance was passed in 1645, and died Sept. 14, 1646.

**Essexite.** Crystalline igneous rock named after Essex co., Mass., U.S.A. Akin to gabbro, which it resembles, but richer in soda and potash than the normal types, it contains purple or green varieties of augite, lime feldspar (labradorite), potash feldspar, and a little analcite or nepheline. Soda-hornblende, olivine, or biotite may also be present.

**Essex Regiment.** Regiment of the British army. Formerly the 44th Foot raised in 1741, it was



Essex Regiment  
badge

given the title of the East Essex Regiment in 1782. In 1881 the unit was amalgamated with the 56th Foot and received its present title. The regi-

ment took part in the siege of Gibraltar (1779-83), gaining the Castle and Key and the word Gibraltar on its colours. It fought in the West Indies and the American War of Independence, and served with Wellington throughout the Peninsular War. The Essex were at Waterloo, and served in the China War, the Crimea, the Indian Mutiny, the Nile Campaign (1884-85) and the South African War. They raised 31 battalions for service in the First Great War, earning the battle honours Le Cateau; Marne, 1914; Loos; Somme, 1916; '18; Arras, 1917, '18; Cambrai, 1917, '18; Selle; Gallipoli, 1915, '16;



Robert Devereux,  
3rd Earl of Essex  
After Walker



and Gaza. During the Second Great War, the Essex fought in the battle of France (1940), with the 8th army in Africa and Italy, and took part in the invasion of the Continent and the subsequent campaign in France and Germany. The regimental depot is at Warley.

**Es Sinn, ATTACK ON.** British operations, Jan.-May, 1916. After his retreat from Ctesiphon, Mesopotamia (now Iraq), General Townshend was closely invested by the Turks at Kut-el-Amara, Dec. 3, 1915, and a relief force was organized under General Aylmer. To reach Kut the Indo-British forces had to storm several positions on the Tigris. The British base camp was Imam Ali Gherbi; and the final objective was the strong entrenched position of Es Sinn, 7 m. E. of Kut. Delayed by adverse weather, Aylmer was unable to make any considerable movement until March 8, when he attempted a flanking movement by attacking the Dujailar redoubt at the S. end of the Es Sinn position. On April 4 the Hannah position was carried, by which time the Felahieh position had been won.

Townshend was in serious need of food and supplies, and great efforts were made by the relieving force. On April 17 the British achieved a small success at Beit Aiessa, but the Es Sinn positions could be neither turned nor carried. On April 24 a desperate effort was made to break the blockade of Kut, and get supplies to Townshend. The steamer Julnar reached Magasis, behind Es Sinn, where it was captured by the Turks. Townshend surrendered on April 25, but the Turks failed to follow up their success, and the situation developed into a stalemate until autumn. Consult My Campaign in Mesopotamia, C. Townshend, 1920.

**Esslingen.** Town of Germany, in Württemberg. It stands on the Neckar, 7 m. E.S.E. of Stuttgart. Its chief interest is historical. The old town, around which are the modern suburbs, is still girt with its walls and towers, while above is the ruined castle. The public buildings include the church of S. Dionysius, dating in part from the 11th century; the 14th century church of Our Lady, a Gothic building restored in the 19th century, and containing some beautiful stained glass and a fine tower; the 13th century Gothic church of S. Paul; a hospital, and several schools. There are two town halls: the older one, dating from 1430, is now a school, and has a wonderful clock; the newer one was formerly

a palace. The industries include large engineering works, railway shops, electrical, textile, leather, toy, and furniture factories and a trade in wine. Esslingen, a town since 886, was a free city from 1209 until 1803, when it was taken into Württemberg. Pop. 43,089.

**Est, CANAL DEL'.** Canal of N.E. France. It extends from the Meuse, near Givet in Ardennes, to Portesur-Saône in Haute-Saône, and has connexion with the Marne and Rhône Canal at Void. Portions of the Meuse and Moselle are included in the canal system, which has a length of 286 m.

**Estaires.** Town of France, in the dept. of Nord. It is on the river Lys, 13 m. W. of Lille, and was prominent in the First Great War. The Allies occupied it early in Oct., 1914, and in the German offensive against the Channel ports of April, 1918, it was the scene of spirited fighting. At the Estaires drawbridge the British held the enemy until the great steel and concrete structure was blown up. Occupied by the Germans, April 11, it was recovered by the Allies early in Sept. See Ypres, Battles of.

**Estate.** Originally a condition, or rank, the idea expressed by the modern word state. It is chiefly used, however, for landed and other property, and all property is by English law classed as either real estate or personal estate. By the word alone is meant landed property, generally a considerable amount under a single ownership and all contiguous. An estate may be of various kinds, freehold, leasehold, or (until 1926) copyhold. See Land Laws; Real Property.

**Estate Agent.** One who acts for another in the management or sale of landed or house property. He lets and collects the rents of estates, farms, houses, cottages, etc., and generally represents the landlord in dealing with tenants. He should have a knowledge of agriculture, bookkeeping, surveying, valuing, forestry, drainage, building construction and repair, and the laws concerning the relations of landlord and tenant.

**Estate Duties.** Name given in the United Kingdom to the duties paid on the estates of deceased persons. They date from 1894,

before which time there were death duties of various kinds, including legacy, probate, and succession



Esslingen. His one town of Württemberg. Gothic church of Our Lady, left, and the Town church, right

duties. In 1894 two new principles were introduced. Real property, hitherto exempt from charges of this kind, was made to pay at the same rate as personal property, and the duties were levied on a graduated scale. This scale varied from 1 p.c. on estates between £100 and £500 to 8 p.c. on estates over £1,000,000. From 1894 until 1946 the rates rose rapidly. The Finance Act, 1946, while increasing still further the rate on estates over £12,500, followed a new policy by exempting all estates not over £2,000 and reducing the rates on estates up to £12,500. The Finance Act, 1949, which abolished legacy and succession duty, left the rates of estate duty unchanged on estates under £17,500, but increased the rates on estates over that amount up to 80 per cent on estates over £1,000,000.

**Estates.** Word used for "an organized collection, made by representation or otherwise, of the several orders, states, or conditions of men who are recognized as possessing political power." Its interest is now solely historical, although we still speak of the estates of the realm. In France, Germany, and some other European countries the same idea is translated by the word states, and so we have the states-general of France and the Dutch Republic.

The idea of estates began about the 13th century with the growth of the representative system, and they are found in Spain and France, as well as in England and Scotland. In France the various provinces, e.g. Brittany and Langue-doc, had their local estates, and in Spain the various kingdoms had theirs. The German countries had also their estates who met in a landtag or diet. It is usual to assume

the number of estates as three, but this is purely accidental. In Sweden and Aragon there were four estates. In England the merchants and lawyers might easily have formed a separate estate, but they did not, and so we have the three estates of lords spiritual, lords temporal, and commons, sitting, however, in two houses. In Scotland the lesser barons formed a separate estate, not sitting, as they did in England, with the representatives of the towns. The sovereign is sometimes referred to as an estate of the realm, and the press is known, a tribute to its power, as the fourth estate, a phrase said to be due to Burke. *See* Diet; Landtag; Parliament; Representation.

**Estcourt.** Town and district of Natal. The town stands at an elevation of 3,830 ft., on the rly. from Pietermaritzburg to Ladysmith, 76 m. N.W. of the former. It was the scene of important operations during the S. African War. At Weenen, 28 m. N.E., parties of Boers were massacred by Zulus in 1838. Pop. dist., 58,483.

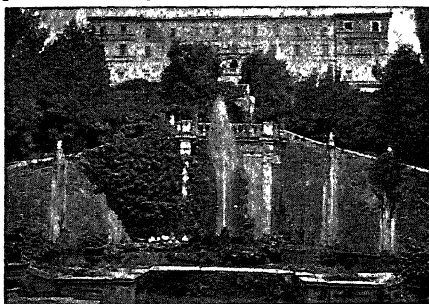
**Este** (anc. *Ateste*). A city of Italy, in the prov. of Padua. It stands on the slopes of the Euganean Hills, 20 m. by rly. S.W. of Padua. It is enclosed by medieval walls, has a ruined castle, a cathedral, and two other churches, one with a leaning bell-tower. The National Museum is rich in prehistoric, lacustrine, and sepulchral relics, besides Greco-Roman antiquities. The manufactures include pottery, ropes, and iron goods. A Roman town, it became the seat of the Este family in the 10th century, and in 1405 it surrendered to Venice. Pop. 11,704.

**Este.** Name of a noble Italian family founded by Oberto II (c. 1015), margrave of Casalmaggiore. His grandson, Azzo II, became duke of Milan, and his sons, Guelph and Fulco, founded the German and Italian branches of the family respectively. From the former the Hanoverian sovereigns of Great Britain are descended.

From the latter came the Italian family which held the lordships of Ferrara, Modena, and Reggio, the emperor Frederick III making Barco d'Este (d. 1471) duke of Modena and Reggio in 1452, and Pope Paul II creating him duke of Ferrara in 1471. His brother, Ercole I (1431-1505), was father of Beatrice

(1475-97), duchess of Milan, one of the most beautiful women of the Italian renaissance.

Alfonso I (1486-1534), who married Lucrezia Borgia as his second wife, he being her third husband, was a statesman and a soldier. His son, Cardinal Ippolito (1509-72), built the magnificent Villa d'Este at Tivoli (the whole upper storey of which, on one side of the courtyard, was demolished by a bomb dropped from an Allied aeroplane in 1944). Alfonso II (1533-97) kept a luxurious court, where he detained the poet Tasso, who was in love with his sister Eleanora. Alfonso IV (1634-62) was father of Maria Beatrice, queen of James II of England. The Italian branch of the family ended with Ercole III (1727-1803), who was dispossessed of the duchy of Modena by the treaty of Campoformio in 1797, and whose only daughter, Maria Beatrice, married



Este. The Villa d'Este at Tivoli, near Rome, built by Cardinal Ippolito d'Este in 1549

Archduke Ferdinand, third son of Francis I of Austria. His son Francis IV (1779-1846) was made duke of Modena by the congress of Vienna in 1814, but his son Francis V (1819-75) was dispossessed by the incorporation of the duchy in the kingdom of Italy in 1859. *See* Modena. *Pron.* Es-ty.

**Ester.** Substance formed by the union of alcohols and acids with the elimination of water. Gmelin first used the term ester to distinguish this class of compounds from simple and mixed "ethers." An ether is an oxide of the alcohol radical analogous to metallic oxides, whereas in esters both an alcohol radical and an acid radical are present. Esters are prepared (1) by the direct action of an acid upon an alcohol; (2) by the action of an acid chloride or the anhydride of an acid upon an alcohol; or (3) by treating the salt of an acid with an alkyl halide, *e.g.* methyl acetate may be prepared by treating silver acetate with methyl iodide. The esters are usually

neutral and colourless substances with a fragrant smell. Many occur in plants, forming the constituent to which the scent is due. They are sometimes manufactured as substitutes for natural perfumes and flavours.

**Esterhazy,** MARIE CHARLES FERDINAND WAIZIN, COUNT (1847-1923). French soldier. He served in the regiment of Papal Zouaves, became a major in the French army, and accused Captain Dreyfus of writing the famous *bordereau*, or document, containing military secrets, said to have been communicated to the German military authorities. The opinion grew that Esterhazy had himself forged the *bordereau* in an imitation of Dreyfus's handwriting, and that he had supplied information to Germany. He was compelled to leave France when the truth became known, and later confessed the forgery. He died in England. *See* Dreyfus Case.

**Esterhazy de Galantha.** Family of Hungarian noblemen. Dating back to the early 13th century, in the 17th they became princes of the German empire. They were prominent supporters of the house of Hapsburg and have included several notable men. Among these were Paul IV (1635-1713), a leading general in the wars against the Turks; Nikolaus Joseph (1714-90), general, diplomatist, and a patron of art, literature, and music; and Nikolaus IV (1765-1833), founder of a famous collection of pictures at Vienna, who declined Napoleon's offer of the crown of Hungary and supported the national Hungarian movement.

**Estevan.** Town in the extreme S. of Saskatchewan, Canada. On the Souris river, it is 145 m. S.E. of Moosejaw by C.N.R. and C.P.R. The centre of a farming and coal-mining district, it has grain elevators, a creamery, a flour mill and a government plant for coal briquettes. Pop. 2,774.

**Esther,** BOOK OF. O.T. book so named after the chief character in the story. When Vashti, the consort of the Persian king Ahashverôsh (Xerxes), was deposed, Esther, the adopted daughter of Mordecai, a Jewish exile, was chosen in her place. She was thus enabled to frustrate the plots of



Count Esterhazy, French soldier

Haman (*q.v.*), a powerful enemy of her people. Haman had cast lots (*purim*) to destroy the Jews, and the real purpose of the book seems to be to explain the origin of the Jewish festival Purim (called in 2 Maccabees, 15, v. 36, the Day of Mordecai). The book of Esther would seem to have been written between 300 B.C. and the Christian era.

**Estimate.** Statement in which is given the anticipated cost or price of specified work. The statement is prepared by the contractor who offers to carry out the work, and submitted for consideration to the person for whom the work is to be undertaken. Estimates are frequently given by builders, painters, or contractors for projected repairs on a relatively small scale. They do not form a legal contract, although in practice the price charged when the work is completed is usually that stated in the estimate. For more extensive operations, tenders setting out the work in detail, and often specifying the quality of materials to be used, are prepared; the tender accepted is usually embodied in a legal contract.

Estimates of national expenditure are submitted annually before the end of March by various government depts. for consideration by parliament. They give the anticipated expenditure of the depts. during the financial year beginning April. Civil depts. submit their estimates through the Treasury, by which they are carefully considered and often adjusted before reaching parliament; but defence depts. submit their estimates without the intervention of the Treasury. Parliamentary control over national expenditure is thus safeguarded and the presentation before the budget speech early in April affords an opportunity for amendment, if necessary, before the inclusion of the estimates in the budget itself.

Civil expenditure is set out under the following headings: central government and finance, foreign and imperial services; justice, police, and prisons; education; health, labour, and insurance, trade and industry, including agriculture and fisheries, roads, and civil aviation; common services, which covers the expenses of the ministry of Works; war pensions; block grants to local authorities; and the expenditure of the ministries of Supply, Food, Transport, etc. Separate headings

show the cost of administering the inland revenue and customs and excise depts. and the post office.

**Estoile** (old Fr., star). In heraldry, a star, usually represented as having wavy rays. If there are six rays or more, only the alternate rays are wavy. An estoile with a number of long rays springing from it at an angle, or with a long tail, is called a comet. See Mullet.

**Eston.** Urban district of the North Riding of Yorkshire, England. It is 5 m. E. of Middlesbrough by railway. It has ironstone mines, steel works of Dorman, Long, and Co. Ltd., a shipyard, large commercial docks, and contains part of a chemical works belonging to I.C.I. Ltd. Pop. 31,142. The Eston breakwater projects from the E. bank of the Tees estuary.

**Estonia.** Republic of the Soviet Union since 1940. It is bounded N. by the Gulf of Finland, E. by the Leningrad region of

industry. Dairy farming prospers and butter is the leading export. Oil-shale of high quality is plentiful. Manufactures include iron, steel, machinery, cement, cotton, paper, wood pulp, and spirits. Estonia carries on a large transit trade, the seaport of which is Tallinn, the capital, connected by railway with Leningrad. Other towns are Narva and Tartu (*q.v.*). Arensburg and Haapsalu are famed for their curative mud baths.

In religion the Estonians are Lutherans, except about 15 p.c. who belong to the Greek Orthodox Church. The standard of education is high, with few illiterates. Secondary education is provided by numerous grammar schools and lyceums. Tartu (Dorpat) university, established by Gustavus Adolphus in 1632, was reopened in 1919 as an Estonian university. Its technical faculty was made an independent university at Tallinn in 1936. Estonia is rich in folklore, the



Estonia. Map of the Baltic state which in 1940 became the 16th Soviet republic

R.S.F.S.R., S. by Latvia and Gulf of Riga, and W. by the Baltic. Its area is 18,353 sq. m. and in 1940 its estimated pop. was 1,120,000. Except in the S.E., which is hilly, the mainland lies low, it is intersected by rivers and streams, and much of it is swampy. There are many lakes, and about half of Lake Peipus lies within it. About 21 p.c. is forest. The climate is warm in summer and cold in winter. Hju (Dago), Saare (Oesel), and other islands belong to Estonia. Agriculture, which is the chief occupation, is conducted scientifically, with the result that good crops, particularly flax, are raised from a naturally poor soil, and there is a flourishing livestock

chief records of which are *Monumenta Estoniae Antiquae*, and the MS. collection of Jacob Hurt, containing songs, tales, proverbs, and other folklore items. After F. R. Kreutzwald published the national epic *Kalevipoeg* in 1861, a new Estonian literature developed in the 19th century, the best-known writers being Otto Masing, Lydia Koldula, Mihkel Weski, and Johan Liiv.

**HISTORY.** The early history of the country is obscure, but early in the 13th century it was conquered by Danes and Germans. The Danes founded Reval (Tallinn) in 1219, and later divided the land between themselves and the Germans, finally selling their

part of it in 1346 to the Teutonic Knights who joined it up with Livonia. After the dissolution of the Teutonic Order in 1560, N. Estonia passed to Sweden. S. Estonia remained under Poland till 1629, when the whole of Estonia became a Swedish province with Livonia, which was ceded to Russia in 1721. German influence was always strong owing to the presence of the Baltic Barons, the descendants of the Teutonic Knights, and of numerous German settlers (Balts), who called the country *Estland* or *Esthland* and its natives the *Ests*. Only after the Russian revolution and the Estonian war of liberation was this dominant German influence crushed.

By decree of the Russian provisional government on April 12, 1917, the prov. of Estonia was united with the N. part of the prov. of Livonia and formed into a new autonomous prov. under a national council or diet. This council was elected by universal suffrage. After the seizure of the supreme power in Russia by Lenin, Estonia, like Finland, decided to become independent. She was about to hold a constituent assembly when the Bolsheviks intervened, and summarily dissolved the national council. During the Brest-Litovsk negotiations, the Germans, to compel Lenin to come to terms, took Tallinn, Feb. 25, 1918, and, marching through Estonia and Livonia, captured Dvinsk and Pskov.

#### After the Brest-Litovsk Treaty

By the Brest-Litovsk treaty the Bolsheviks undertook to evacuate those territories, which were to be policed by the Germans until the state organization of both provinces was restored. As this would have virtually meant the complete Germanisation of these regions, the people, 90 p.c. of whom were pure Estonians, made emphatic protests to the Allies, and Great Britain, France, and Italy recognized their national council. But the Germans remained masters of the country, and it was not till Nov. 11 that the Estonians recovered power. Next the Bolsheviks began an invasion which carried them to within 15 m. of Tallinn. Finland came to the aid of Estonia with 5,000 rifles, and on Dec. 12 a British fleet entered the capital in support with arms and munitions. Meanwhile Estonia had organized her army under a former Russian staff officer, and by Feb. 24, 1919, her soil was free of the invaders.

Longing for peace, the new state accepted proposals for a conference made by the Soviet government. This took place at Pskov on Sept. 19, but the Estonian delegates made it a condition that Bolshevik peace proposals were to be submitted to all the Baltic states together, to which the Soviet representatives agreed. After difficult and interrupted negotiations, peace was finally made Feb. 2, 1920, the independence of Estonia being recognized by the Soviet government.

#### Russia's Demand for Bases

In the autumn of 1939 Russia made demands on Estonia for naval and air bases, and on Sept. 25 the two states signed a mutual assistance pact. Russian aeroplanes, warships, and troops occupied strategic points on Oesel and Dagó and in the town of Baltiski. In June, 1940, Russia demanded a change of government and free passage for Soviet troops; and in Aug. Estonia became the 16th Soviet republic.

When Germany attacked Russia in June, 1941, one thrust was made through Lithuania, Latvia, and Estonia to Leningrad. German forces advanced on both sides of Lake Peipus to cut off the Russians in Estonia and directly threaten Leningrad. Tallinn was evacuated at the end of August, leaving Estonia, apart from Oesel, in German occupation. In 1944 Russian armies began to exert heavy pressure against the Germans in Estonia, reaching Lake Peipus and the Narva river early in Feb. Tallinn was liberated on Sept. 22 and Pernau the following day. By Sept. 29, Estonia had been freed from the invaders, except the islands of Dagó, freed Oct. 3, and Oesel, cleared of the enemy Nov. 24. *Consult* Estonia, J. A. Jackson, 1941.

**Estoppel** (old Fr. *estoper*, late Lat. *stuppare*, to stuff with tow, *stuppa*). Doctrine of English law. Broadly, it means that in certain circumstances a party will not be allowed to show the truth in his own favour, when he has, by some act or deed or negligence, led the other party to believe that something else is the truth. Estoppel is (1) by deed; (2) *in pais*, or by act; (3) by negligence. (1) If A makes a deed of conveyance of Whiteacre to B on March 1, reciting in it that he (A) is the owner, and in fact he is not, but on some subsequent day he becomes the owner, the estate at once passes to B, because A will not be allowed to come and say that on March 1 he had no right to con-

vay. Generally speaking, every statement made by a man in a deed estops him from denying the truth of it. (2) If A does an act or makes a statement which causes B to alter his position, A is not allowed afterwards to aver against B anything to contradict the act or statement. Thus, if A takes lease of a house from B, he cannot afterwards say that B is not the owner thereof and refuse to pay his rent. (3) If A by his negligence causes B to alter his position, he is not allowed to dispute the correctness of B's action so as to take advantage of his own negligence.

**Estournelles de Constant**, PAUL HENRI BENJAMIN, BARON D' (1852-1924). French politician. He was born at La Flèche, Sarthe, Nov. 22, 1852. Councillor of the French embassy in London, 1890-95, then deputy for Sarthe until 1904, he represented France at The Hague peace conferences of 1899 and 1907. A member of the international court of arbitration, 1909, he received the Nobel peace prize the same year. After the First Great War he was appointed director-general of the French museums and art galleries, and strove for a Franco-German democratic rapprochement. He published a number of books on European and general peace problems. He died at Bordeaux, May 15, 1924.

**Estovers** or **BOTES**. Certain furnishings of wood that a tenant is allowed to cut and use for the purpose of his holding. They include *firebote*, or wood for firing, *ploughbote*, to mend his plough; *housebote*, to repair his house; and *hedgebote*, to maintain his fences. Estovers are usually, if not always, enforceable by the custom of a manor, and are rights indefeasibly attached to the lands that form part of that manor; that is to say, they are not personal rights, but must be claimed in the character of holder of the lands. Estovers is old Fr., necessities; *bote* is mid. Eng., advantage. *See* Lopping.

**Estray** (old Fr. *estramer*, to stray, wander from the street, Lat. *strata*). Term used in law for a strayed animal. An ancient law of England says that if valuable tame animals are found wandering at large they are to belong to the sovereign. But in most cases the sovereign long ago granted the right in them to the lord of the manor where they might be found. They must be "proclaimed" in the nearest church and two market towns, and, if not claimed in a year and a day, are irredeemably lost to the owner. *See* Pound.

**Estreat** (old Fr. *estrait*, extract). Term used in English law, meaning to forfeit something, generally a sum of money, by way of enforcing an obligation to the crown. It usually occurs in the case of recognizances, where a person has agreed to do or not to do something in face of a court under penalty of paying so much if he does not fulfil the obligation. Thus, A. B. will enter into a recognizance to keep the peace for six months under penalty of £50. If he breaks the peace within that time his recognizance may be estreated, and the like happens if X. Y. goes bail in £50 that A. B. should appear and stand his trial. The bail will be estreated if A. B. does not duly appear. Estreat is enforced by levying a distress upon the property of the person liable. The original meaning of the word is a copy or extract of an original record or document.

**Estrées**, GABRIELLE D' (1573-99). Mistress of Henry IV of France. Daughter of Marquis Antoine d'Estrées, she met Henry at Coeuvres in 1590. Impressed by her beauty, the king caused her to be divorced from her husband, Nicholas d'Amerval, Sieur de Liancourt, and in 1592 he fetched her to Paris, where she bore him several children. He created her marquise de Monceaux and duchesse de Beaufort, and was so infatuated that, had she not died suddenly at Paris, April 10, 1599, he would have divorced Marguerite de Valois and made her his queen. *Consult Life* (in French), A. Desclozeaux, 1889. *Pron.* Estray.

**Estrella**, SERRA DA. Range of mountains of Portugal, in the prov. of Beira. Lying midway between the Tagus and the Douro rivers, virtually forming the watershed between the Mondego and the Zézere, it reaches its highest point in Malhão, 6,540 ft. A verdure-clad range, it commands extensive views, and runs, from S.W. to N.E., a distance of 75 m.

**Estremadura**. Province of W. Portugal, S. of Beira. It is divided into the districts of Leiria, Santarém, Lisbon, and Setúbal. Its otherwise regular coast-line is broken by the estuaries of the Tagus and the Sado rivers. N. of the Tagus it is hilly; to the S. it is low-lying with marshy land. Some parts are fertile, others barren; barely half is under cultivation. In the Tagus valley wine, oil, and fruit are produced. The manufactures are of little importance, but cork, salt, soda, and fish are exported, and herbs are grown

on the sandy plains. Area, 6,937 sq. m. Pop. 2,114,658.

**Estremadura** OR EXTREMADURA. Territorial division of S.W. Spain, co-extensive with the provinces of Cáceres and Badajoz. An arid plateau, denuded of its forests, lacking water, and depopulated by emigration to S. America, it is largely barren, heath-covered waste or undulating pastureland, feeding huge droves of migratory sheep and pigs. Principal rivers are the Tagus and Guadiana. The soil is naturally fertile, but agriculture is hindered by drought and locusts. Wine, olive oil, cork, figs, and almonds are produced, and oak and chestnut woods afford food for swine. Minerals exist but mining is backward. There was heavy fighting on the Estremadura front late in 1938 at the end of the civil war. Area 16,054 sq. m. Pop. 1,303,784.

**Estuarine Deposits**. Accumulations of sediment transported by a river and laid down near its mouth. They depend on grade of sediment, strength of current, and depth of river. Frequently the dropping of sediment, caused by the checking of the stream by the sea, forms a barrier across the mouth, and lagoon conditions are established inside. In former geological periods such conditions have resulted in deposits marked by comparatively limited extent, usually sandy facies, and accompanied by characteristic vegetation and animal remains (shellfish, etc.), e.g. inferior oolite beds of Yorkshire.

**Estuary** (Lat. *aestus*, tide). Arm of the sea into which a river flows. As a rule an estuary consists of the drowned lower portion of a valley. Where the land slopes gently down below sea level and the shores are wider apart nearer the open sea the estuary is a *ria*, or drowned river valley; the indentations of S.W. Eire belong to this type. The indentations of the Norwegian coast, the fjords, are steep-sided, deep estuaries which are shallow near the entrance; they are due in part to glacier action. On some coasts estuaries arise from the emergence above the water of sand banks, which transform a bay into a lagoon filled with river water. Such estuaries are the *haffs* of the S. shores of the Baltic. British estuaries are notably more extensive than the rivers which now flow into them; thus inconformity indicates submergence. Estuaries tend to be filled up with alluvium, the Dee estuary being

thus almost useless for navigation. *See* Coast; River.

**Eszék** OR OSIJEK. Town in the N. of Yugoslavia. It is on the right bank of the Drave, 125 m. by rly. N.W. of Belgrade, and is the first important town above the confluence with the Danube. Here one rly. crosses the Drave from the N. and four lines radiate S. of the river to various centres in Slavonia. As the capital of Slavonia, Eszék is a busy trading centre and is strongly fortified. Silk factories and flour mills derive their motive power from the river. Pop. 40,337.

**Esztergom** OR GRAN. City of Hungary, on the right bank of the Danube, 38 m. by rly. N.W. of Budapest. It is the eccles. capital, having been the birthplace of S. Stephen, king of Hungary. The cathedral (1821-70) was said to be the finest building of its kind in Hungary. The centre of an agricultural and vine-growing district, it is noted for its thermal springs. Below the town the Danube flows in a contracted valley and makes its great bend to the south.

At Esztergom was the river bridge for road traffic from Budapest to the Little Alföld. In the Second Great War it was entered by Marshal Tolbukhin's forces on Dec. 26, 1944, during the Russian offensive resulting in the investment of Budapest. The Germans made desperate efforts to relieve Budapest, and the Russians were compelled to evacuate Esztergom on Jan. 7, 1945. They did not retake it until March 25. Pop. 17,360.

**Etah**. District and town in India, in the Agra division of the United Provinces. The area of the district is 1,719 sq. m. Sixty p.c. of the land is cultivated, among the chief crops being wheat, barley, maize, grain, cotton, sugar-cane, and indigo. The headquarters of the district are situated in the town of Etah, which dates from the 14th century. Pop. of dist., 984,760.

**Etah**. Settlement on the coast of Greenland. In Prudhoe Land on Smith Sound, it is inhabited by Eskimos.

**Étampes**. Town of France, in the dept. of Seine-et-Oise. It stands on the Juine, 38 m. by rly. S.S.W. of Paris, and has a number of small industries, including flour-milling, but is chiefly a market for agricultural produce. In the Middle Ages it was comparatively more important, and its old buildings included the churches of Notre Dame, S. Basil, S. Gilles, and S. Martin;

and the 16th century hôtel de ville. Francis I made one of his mistresses duchess of Étampes. Here also was a house once occupied by Diana of Poitiers. Étampes, included after June, 1940, in German-occupied France, was liberated by U.S. troops Aug. 22, 1944. Pop. 10,425.

**Étang** (Lat. *stagnum*). French word for a shallow sheet of water somewhat similar to a lagoon. These are frequent in the S.W. part of France, bordering the Bay of Biscay. One of the largest is the Étang de Berre, in the dept. of Bouches-du-Rhône. It has communication by the Passe de Martigues, a narrow channel, with the Gulf of Foz and the Mediterranean. Its area is about 81 sq. m., and its average depth is 20 ft. It is noted for its eel fisheries and salt works.

**Étaples.** Town of France, in the dept. of Pas-de-Calais. It stands on the estuary of the Canche, 17 m. S. of Boulogne, and near the coast. It is the railway terminus for Paris-Plage, and is a fishing centre. In early days it was a flourishing port, and here, in 1492, England and France made a treaty. The First Great War created a temporary Étaples of wider dimensions, as an important British military base and training station. It expanded N. along the main road to Boulogne, a city of hospitals in that direction. On May 19, 1918, the Germans made a night air raid on its hospitals, causing about 300 casualties. The British war cemetery on the Camiers road, visible from the main Boulogne-Paris rly., contains 11,000 graves. See Cemetery plate, facing p. 1889. In the Second Great War Étaples was captured by the Germans during their rapid advance on Boulogne, which they entered on May 23, 1940. The town was liberated by units of the 1st Canadian army on Sept. 4, 1944.

**Etawah.** District and town of India, in the Allahabad division of the United Provinces. The district has an area of 1,669 sq. m. Fifty p.c. of it is under cultivation, the chief crops being wheat, gram, millet, and barley; cotton is also grown. Etawah town is on the Jumna and on the East Indian rly., 60 m. S.E. of Agra. It contains a mosque and a number of Hindu temples. Trade consists largely in ghi, gram, cotton, and oilseeds. Pop. dist., 883,264, 90 p.c. Hindus; town, 53,114.

**Etching** (Ger. *ätzen*, to corrode). Method of engraving on metal either by biting with an acid a

design drawn through a ground specially laid on the metal, or by drawing with a needle directly on the metal. Of several metals used for this purpose, among them iron, zinc, and pewter, copper is by far the most common.

In etching by acid, the plate is covered with a coating of wax or other resinous substance, and to this ground are transferred the details of a drawing by laying upon it the paper upon which the design has already been made in black pencil or red chalk and

posed long enough to complete the erosion. The duration of the bath will depend upon the elaborateness of the drawing.

Soft ground etching resembles pencil drawing or lithography in its final result. The etching ground is made by mixing ordinary etching ground with about half its weight in tallow or other fat. It is laid upon the plate and blackened with smoke as for ordinary etching. A piece of thin paper is then strained over the surface of the plate, and upon this the draw-



Etching. Rembrandt with the Sabre, an etching by Rembrandt, dated 1634. Only four first impressions of this exist, one being sold in 1893 for £2,000

passing it through a hand press. The drawing is then traced with a steel needle through the wax down and into the copper, and when it is finished the plate is submitted to the action of nitric or other acid. The parts that are to come light and sketchy are exposed for a certain time to the mordant and then "stopped out" with a suitable varnish to prevent further action of the acid in these passages; the parts which contain more work and are to be darker are exposed for a further period, and when sufficiently eaten are, in turn, stopped out; the parts which contain the heavy shadows and blacks are then ex-

ing is made with a lead pencil. The back of the paper, where the pencil point has travelled over its surface, sticks to the ground, and when the paper is removed part of the ground comes with it, leaving the lines that have been drawn marked on the ground with a grain corresponding to the grain of the paper used.

In the dry-point method of etching, the artist draws his subject with a hard, sharp steel point upon a perfectly clean, unscratched, flawless copper plate. Dry point was also employed to some extent to define the general features of a drawing that was to be finally treated by the method of line



engraving, and, on the other hand, the graver was occasionally borrowed to open up work or strengthen an effect which the unaided needle could not satisfactorily accomplish.

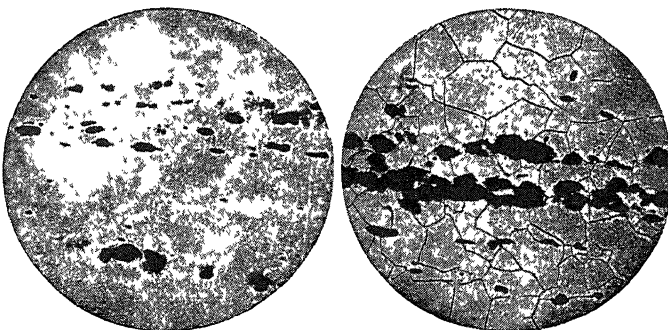
Etching dates from the time of Albert Dürer (1471–1528), who dry-pointed several plates in 1512 and 1518, but found it an unsympathetic medium, and abandoned etching in favour of engraving. Iron, the metal used in early experiments, did not lend itself to subtle or delicate effects. Van Dyck's instinct for form led him to what is now regarded as the secret of etching—economy of line, and dramatic contrasts in force and precision. No practitioner, however, has ever rivalled the productions of Rembrandt. His plates reveal broad yet drastic treatment; some of the finest examples include the *Ecce Homo*, and the *Three Crosses*. His landscape etchings stand apart as supreme examples of simplicity in their mastery of detail; in his numerous portraits he shows great variety of costume and character.

The greatest etcher in England during the 17th century was Hollar (1607–77), a native of Prague, who spent the greater part of his life in Britain. Of the Italians the most brilliant were Annibale Carracci, Barbieri, and Caletti, but greater was Ribera (1588–1652), a Spaniard who worked in Naples. Goya (1746–1828) stands supreme in the art of etching. In the *Caprichos*, *Proverbios*, and *Desastros de la Guerra*, he used aquatint (*q.v.*) for the backgrounds—a medium which instead of line deals with broad masses, and which was frequently used by English artists of the early 19th century to repro-

duce water-colour drawings. Goya repeatedly used an etched line as guide and basis for tonal work.

The revival of etching in England during the latter half of the

papers, decreasing successively in fineness, and polishing on cloth with fine abrasives. This leaves a smooth surface, free from scratches, similar to that shown in Fig. 1, a



Etching: preparation of specimens for microscopical examination. The same wrought iron unetched (Fig. 1, left) and etched (Fig. 2, right).  $\times 120$

19th century was due to the influence of Whistler (1834–1903), F. Seymour Haden (1818–1910), and Legros (1837–1911). The tradition was carried on by a number of brilliant technicians, D. Y. Cameron (1865–1945), Muirhead Bone (b. 1876), William Strang (1858–1921), James McBey (b. 1883), Joseph Pennell (1860–1926), and F. Brangwyn (b. 1867).

**Bibliography.** About Etching, F. S. Haden, 1878; Etching and Engraving, W. Strang and H. W. Singer, 1897; Etchers and Etching, J. Pennell, 1920; History of Engraving and Etching, A. M. Hind, 1922; The Art of Etching, G. S. Lumsden, 1925; History of British and American Etching, J. Laver, 1928.

**Etching.** A metallurgical process. Before a specimen sample of a metal can usefully be examined under a microscope, it must be carefully prepared. This involves rough shaping and grinding, fine grinding with emery

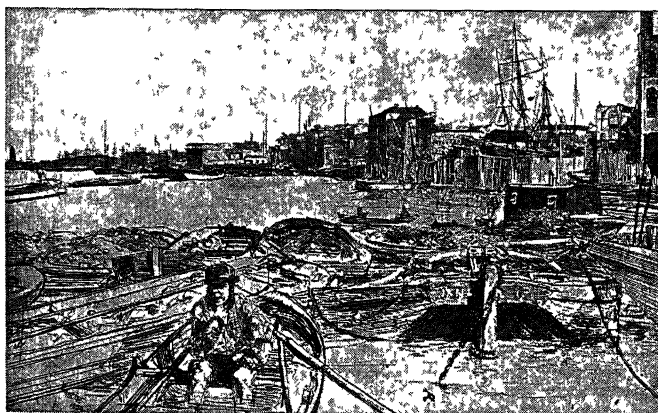
wrought iron. All that can be seen is a smooth surface with some patches of black slag, which have been forged into the iron. In order to see the crystalline structure of the metal beneath, the flowed, smooth surface must be removed by the action of acids or alkalis, or individual particles of varying composition must be revealed by differential staining. In Fig. 2, which is the same sample as before but etched in a 2 p.c. solution of nitric acid in alcohol, the boundaries of the crystals are clearly seen as dark lines separating the crystals themselves.

**Etesian Winds** (Gr. *etēsios*, yearly). The prevailing northerly winds blowing in summer in the Mediterranean region. They blow very strongly up the Nile valley, and are of great value to the dahabiyehs, to help them up the river against the current.

**Ethandun.** Name given to the great victory of Alfred of Wessex against the Danes under Guthrum in early May, 878. As a result, the Danes accepted a division of territory and Christian baptism. Edington, Wilts, is suggested as the site. See Alfred.

**Ethane.** Colourless gas ( $\text{CH}_3\text{—CH}_3$  or  $\text{C}_2\text{H}_6$ ), boiling at  $-84^\circ\text{C}$ . It is soluble in alcohol and nearly insoluble in water, and is prepared by the electrolysis of sodium or potassium acetate, or by passing a mixture of hydrogen and acetylene over finely divided nickel. It burns with a faintly luminous flame.

**Ethel.** Anglo-Saxon word meaning noble, formerly spelt aethel. It is found as a prefix to Anglo-Saxon names for both sexes, e.g. Ethelfrith and Ethelflaeda. Today it is a feminine Christian name.



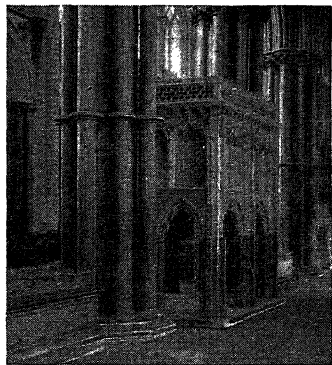
Etching. The Pool of London, a typical etching by J. M. Whistler, dated 1859

**Ethelbald.** King of Wessex from 858 to 860. The second son of Ethelwulf, he assisted that king in the battle of Ockley against the Danes in 851. He married his stepmother, Judith, daughter of Charles the Bald. He was buried at Sherborne.

**Ethelbert** (c. 552-616). King of Kent, son of Eormenric, and a descendant of Hengist. He became king about 560 and was defeated by the W. Saxons, 568. In 597 his over-lordship is said to have extended over all the English kings as far N. as the Humber. His wife was a Christian—Bertha, daughter of the Frank king of Paris, Charibert—and in 597 Ethelbert was baptized by S. Augustine. He issued in 600 a code of laws known as *dooms* (*q.v.*), one of the earliest documents in English. He died Feb. 24, 616.

Another Ethelbert was king of Wessex and Kent. Third son of Ethelwulf, he succeeded his brother Ethelbald in 860 and had a difficult reign largely occupied with fighting against the Danes. He died in 866 and was buried at Sherborne.

**Etheldreda, SAINT** (c. 630-679). Abbess of Ely, often called S. Audrey. The third daughter of



Etheldreda. Her shrine in Ely cathedral to which place she was translated in 1106

King Anna of E. Anglia, she was born at Exning in Suffolk. Married first to Tonbert, an E. Anglian prince, secondly to King Egfrid of Northumbria, she shunned the married state and became a nun at Coldingham. About 672 she founded a monastery on her own estate at Ely and died June 23, 679. Ely Cathedral marks the site of her grave, and the church in Ely Place, Holborn, is dedicated to her.

**Ethelfleda** (d. 918). Eldest daughter of Alfred the Great, known as the Lady of the Mercians. Brought up at Alfred's court, she married Ethelred, earl of Mercia.

After her husband's death, 911, she became sole ruler of Mercia, which she secured against attack by building numerous fortresses. In 916 she ended the incursions of the Welsh by taking Brecknock and capturing the king's wife. She died at Tamworth, June 12, 918, and was buried at Gloucester.

**Ethelfrith** (d. 617). King of Northumbria. He was the son of Ethelric, king of Bernicia, whom he succeeded about 593. He married the daughter of Ella, king of Deira, and drove out his son Edwin. In 603 he defeated the Scots at Daegsastan, and about 613 the Welsh at Chester. He was defeated on the banks of the Idle by Edwin's protector Raedwald, king of E. Anglia, and was slain in the battle.

**Ethelred I** (d. 871). King of Wessex and Kent. Son of Ethelwulf, king of Wessex, and elder brother of Alfred the Great, he succeeded his brother Ethelbert in 866. In his reign the northern kingdoms were in the hands of the Danes, against whom in 871 Ethelred and Alfred fought six battles, the most notable being the English victory at Aescesdun, or Ashdown. The white horse at Uffington, Berks, is traditionally supposed to commemorate this success. A pious ruler, Ethelred made a pilgrimage to Rome, possibly in the hope of averting the Danish peril, and died of wounds received in battle, April 23, 871. He was buried at Wimborne.

**Ethelred II** (c. 968-1016). King of the English. Son of Edgar by his second wife Aelfthryth, he was known as the Unready or the Redeless from his inability to discern good rede or counsel. He succeeded his stepbrother Edward the Martyr in 978 and was crowned by Dunstan at Kingston. In constant conflict with the Danes, he instituted the danegeld, for raising tribute to buy them off. The king seems to have been incompetent rather than vicious, but could be capable of cruelty, and in 1002 a general massacre of Danes was carried out on S. Brice's day, Nov. 12, by Ethelred's command. This led to further invasions, higher danegeld, and eventually to the recognition of Sweyn, king of Denmark, as king of England. Ethelred fled to Normandy, 1014, but reigned again after Sweyn's death. His wife was Emma, daughter of Richard, duke of Normandy; and his son Edmund Ironside. He died April 23, 1016.

**Ethelwulf** (d. 858). King of Wessex. Son of Egbert and father of Alfred the Great, he succeeded

his father in 839, Athelstan being made king of Kent. The Danes wintered in England for the first time in his reign. In 851 he routed them at Aclea, perhaps Ockley. He went on pilgrimage to Rome in 855 with his son Alfred and brought back his second wife, Judith, daughter of Charles the Bald. On his return he made over Wessex to his son Ethelbald, who in his absence had seized Kent, which Ethelwulf retained for his own rule. He was buried at Winchester.

**Ether** (Gr. *aithēr*). In physics, according to the older theory, a tenuous, elastic medium supposed to permeate space and to fill the interstices between the particles in all forms of matter. By this theory the ether is considered to be the medium through which light waves and other electro-magnetic waves are propagated. In fact, the theoretical ether was invented to account for the wave propagation of light. The early, mechanical, theory was gradually abandoned after the publication of the electro-magnetic theory of light by James Clerk-Maxwell in 1864 and the discovery of the Hertzian waves by H. R. Hertz in 1888. A number of variant explanations were then put forward having an electrical basis for the ether.

Experiments to determine the velocity of light brought incidental problems concerned with the existence of this subtle, elastic, all-pervading medium of propagation. In 1881 Michelson and Morley made the first historic experiment on these lines, with a negative result; later repetitions brought the same result, with the exception of one carried out by D. C. Miller in 1925 at Mt. Wilson Observatory. Briefly the aim of the experiments was to find out if the velocity of a light beam projected in the direction of the imagined ether stream—i.e. in the direction of the earth's motion—was the same as that of a light beam projected in a direction at right angles to that of the ether stream. The two beams were sent out and reflected back to the point of propagation; here, by means of an interferometer, any difference in the time of the journey to and fro would have been disclosed by an aberration—an optical effect—but, as stated, the result showed no such aberration in almost all the experiments. These experiments called in question the very existence of the theoretical ether.

In 1905 Albert Einstein published his special theory of relativity, and ten years later his

general theory. The failure of the Michelson-Morley experiments and similar later ones to show a difference in the velocities or propagation times of the two light beams sent out at right angles offered a confirmation of Einstein's theories, which dispensed with the ether and held that a light beam, whether sent out from a stationary system or a moving system, would have the same velocity. *See* Einstein, A.; Light; Michelson-Morley Experiment; Relativity.

**Ether.** In chemistry, the term denoting a large group of carbon compounds, the molecule of which contains an atom of oxygen attached to two groups such as  $\text{CH}_3$ ,  $\text{C}_2\text{H}_5$ ,  $\text{C}_3\text{H}_7$ , etc. If the ether contains two similar groups it is called a simple ether; if it contains two different groups it is called

a mixed ether; thus  $\text{O} \begin{array}{l} \diagup \text{CH}_3 \\ \diagdown \text{CH}_3 \end{array}$

(dimethyl ether) is a simple ether but  $\text{O} \begin{array}{l} \diagup \text{CH}_3 \\ \diagdown \text{C}_2\text{H}_5 \end{array}$  (methyl ethyl ether)

is a mixed ether. The ether well known as an anaesthetic is diethyl ether  $\text{O} \begin{array}{l} \diagup \text{C}_2\text{H}_5 \\ \diagdown \text{C}_2\text{H}_5 \end{array}$ ; it is a colourless

liquid boiling at  $34.5^\circ \text{C}$ . and has a characteristic smell; when used as an anaesthetic it is usually mixed with chloroform and alcohol; it is manufactured by cautiously heating a mixture of alcohol and sulphuric acid to a temperature of about  $140^\circ \text{C}$ .

In medicine, ether was much used as a digestive and cardiac stimulant, but today is less prescribed than other allied preparations. Ether evaporates rapidly, producing great cold, and a spray directed against the skin results in local anaesthesia permitting of the painless performance of certain surgical procedures. Its most valuable use is as a general anaesthetic, either alone or combined with chloroform. Though less directly dangerous than chloroform, it is an irritant to the respiratory passages and should not be used in cases where lung trouble might be expected to follow the anaesthetic.

**Etherege,** SIR GEORGE (1634-91). English dramatist. Of an Oxfordshire family, he studied law, but gave his time mainly to the life of a man of fashion. In 1664 his first comedy, *The Comical Revenge, or Love in a Tub*, was produced at the Duke's Theatre, and from that time its author's name and fame were assured. A second,

*She Would if She Could*, and then a third, *The Man of Mode*, followed, each a distinct success. *Etherege* was knighted, and in 1685 James II sent him to represent England at Ratisbon (Regensburg). From 1688 he lived mainly in Paris, where he died. *Etherege* may be described as the originator of the modern comedy of social life. His knowledge of the life of his time was complete, and his portraiture of its gallants, ladies, and their surroundings perfect.

**Ethical Society.** A society founded for the culture of morality apart from theology. Its members profess freedom from all religious

creeds, but opposition to none. The movement began in the U.S.A., largely through Felix Adler, who founded the New York Ethical Society, in 1877. It spread to England, Stanton Coit (*q.v.*) and Moncure D. Conway (*q.v.*) doing much for its advancement. South Place Ethical Society, which met formerly at South Place, London Wall, and later built Conway Hall, W.C.1, and the W. London Ethical Church, Bayswater, W., is the principal London society. The more important English ethical societies are federated in a union, the offices of which are at 4a, Inverness Place, W.2.

## ETHICS: THE SCIENCE OF MORALITY

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*Further information on philosophy, of which Ethics is a branch, will be found in the articles Metaphysics; Philosophy; Psychology. See also biographies of Aristotle; Green; Hegel; Kant; Plato, and other philosophers*

Ethics is the inquiry into human conduct in so far as conduct is right or wrong, or has moral value. The term good is used to denote that which possesses such value, and thus ethics is sometimes described as consisting of an inquiry into the meaning of good. It is to be distinguished from anthropology or sociology, sciences which do not exclusively refer to moral values, being mainly descriptive or scientific, while ethics is essentially reflective or philosophic. "How is human life organized and carried on?" is the question of sociology and allied sciences. "What is the aim of human life, and what the chief end of man's activities?" is the question which ethics has to answer. Starting with men's moral judgements of right and wrong, of good and bad, it asks what they imply as to man's nature, in what relation they stand to scientific and aesthetic judgements, and how and in what sense they are objective.

### Man's Choice of Action

The fundamental conception of ethics is that of value. It assumes that man is not an animal with certain fixed wants, whose different actions are merely different ways of satisfying the same fundamental needs, but that, over and above his simple physiological requirements, man has other wants, changeable and changing, between which he chooses. This act of choosing between different wants, or the preference of one satisfaction to another, is valuation.

From this valuation or appraisal of wants must be distinguished the actual steps which have to be taken to satisfy these

wants, or the discovery of means towards the ends which man has approved. Generally speaking, this may be called the sphere of economic activity, whether technical, if occupied with the adaptation of the material world to man's peculiar wants, or economic in the strict sense, if occupied with men's relations so far as they will produce most efficiently what man wants. Economic activity, then, unlike ethics, takes for granted the end of man's efforts and deals solely with the means to attain that end. It is not immoral; simply non-moral.

Some have denied that this distinction between these aspects of human conduct exists. Naturalistic ethics tries to show that man's conduct can in all respects be explained by the working of certain evolutionary laws and forces. Behaviour, it is argued, has not changed owing to any change in the conception of the end to be attained, but, being directed always to the one end of the survival and continuance of the human species, has altered only with changes in human environment. Were this conception true, ethics would become only a part of biological science. Looking more closely, however, at the struggle for survival, it is plain that both degeneracy and progress have been produced. The survival of the fittest means strictly the struggle of the fittest to survive, and the judgement that the results of the process are some good and some bad, cannot be got from the process itself, but from ethical reflection upon it. Adaptation to environment must certainly be taken into account in a history of ethics,

but no less must ethics make allowance for those variations in the ultimate standard of life for which men are prepared to struggle. The attempt to explain history by assuming that men's aims are always the same will not fit the facts.

This distinction between technical activity and conduct was first elaborated in Greek moral philosophy. The ethics of Plato deal with the good of the individual, the good of society, and the relations existing between them. Thus, in *The Republic*, he sought chiefly to determine the nature of justice as such, and the means of attaining justice in the relations of men, i.e. in society. He showed that life could be regarded as divided between a number of skilled processes or arts.

#### Plato and Ethics

Conduct, however, was not one of these, but was concerned rather with the relations between the ends of all these human processes and the relation of these ends to life itself. All the arts and activities of life he regarded as subordinate to the one purpose of life as a whole, which he called the good. This idea of the good is at once the eternal object of all human speculation, and a practical ideal capable of human attainment, such as justice or temperance. Ethics, then, was an inquiry into the good which all men sought, but the nature of which none properly understood. Greek thought sometimes regarded the good as attainable by the harmonious adjustment of human desires to one another, making pleasure, or the satisfaction of the greatest possible number of desires, the *summum bonum*, or highest good. But Plato showed that such a harmony was impossible without the recognition that certain activities or wants of the soul were higher than others. Thus, though Plato still regarded ethics as a matter of knowledge, he made clear that knowledge of the good was different from skill and involved certain emotional elements, was not in fact purely a matter of reason.

Aristotle elaborated the distinction between knowledge and moral insight, dwelling especially on the nature of the deliberate choice or will of man in his search after the good life. Here he insisted that both emotional and intellectual elements must be recognized, and pointed out that in an art the end existed outside the means, calling therefore for knowledge, while in conduct the end lay within the act itself, a recognition of moral insight.

Greek moral philosophy, however, preoccupied with the notion of the supreme good, remained intellectualistic, as may be seen in its difficulty in explaining that outstanding fact in human conduct, moral conflict and the weakness of the will. Characteristic also was the Greek identification of ethics with politics. The relations of men with each other were conceived as analogous to those of the different desires within the individual, a manifold to be reconciled within the harmony or unity of the good life, that is, according to Aristotle, the complete exercise of man's rational functions which differentiate him from the rest of creation. Other important schools of Greek ethical thought were those of the Cyrenaics and Epicureans, who interpreted morality in hedonistic terms, and those of the Cynics and Stoics, who held rational virtue to be an end in itself.

In modern times the greatest influence has been the growth of the natural sciences with their view of nature as one deterministic system. This assumption made a sharp contrast with the Christian, and especially the Protestant, insistence on the absolute worth of the individual, and so has focussed ethical inquiry on the problem of the freedom of the will.

#### Immanuel Kant

The modern point of view is represented better by Immanuel Kant than by anyone else. He regarded the outstanding fact of conduct as the contrast between what *is* and what *ought to be*, and emphasised the impossibility of deriving the latter from the former. However much we may learn of the influence of heredity and environment upon human action, the statement that an action is wrong implies that it ought not to have been done, and therefore need not have been done. Here is the contrast with the deterministic conceptions of modern science. The possibility of alternatives of action is as fundamental for human conduct as determinism for the natural sciences.

How the two are to be reconciled is a matter for metaphysics. Ethics is content to show that conduct implies a definite principle of action, not inconsistent with man's heredity or environment, but different and undervivable from such influences. The judgement of value, then, so closely bound up with conduct, is seen to tell us something about the nature of man.

How its undervivable and immediate character is consistent with the change and development of ethical judgements in history; how ethical

progress takes place in the developed moral insight of individuals; how ethical progress finds expression in a system of social rights and obligations; how moral judgements imply something more than the mere results of human reasoning, and yet may have an objectivity different from, but as real as, that of scientific judgements—these are the questions with which ethics is concerned.

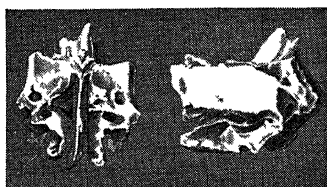
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**ETHIOPIA** OR **AETHIOPIA** (Gr. *Aithiopia*). In ancient geography, name given by the Greeks to the whole of Africa from the Red Sea to the Atlantic, in a narrower sense to the territory comprised in the modern Nubia, Sennar, Kordofan, and part of Abyssinia. The name, derived according to Greek popular etymology from *aithēn*, to burn, and *ōps*, face, was originally applied to all countries inhabited by persons of dark-brown or black colour, the result of the heat of the sun. In the Homeric poems the Ethiopians are described as dwelling on the uttermost confines of the earth, a pious and blameless people, often visited by the gods. According to Herodotus, they were divided into the straight-haired Ethiopians of the E. and the curly-haired Ethiopians of the W.

From the earliest times the history of the country was intimately connected with that of Egypt, which was more than once under the rule of Ethiopian kings. The first Ethiopian kingdom was that of Napata (mod. Merawi), founded about the 11th century B.C. After the invasion of the country by Cambyses in 524 B.C. the capital was removed to Meroë (Assur, near Shendi) in the S., and a new kingdom arose which lasted until about the beginning of the Christian era, chiefly ruled by princesses called Candace, probably not a name but a title like Abgar and Pharaoh. The Romans made expeditions into the country, in one of which (24 B.C.) the Ethiopians suffered a severe defeat; but the conquered territory was abandoned by order of Augustus. The name Ethiopia is also given to a Christian kingdom established in the Abyssinian highlands, with capital Axumis (mod. Axum). This was the origin of the empire of Abyssinia, the official title of which is still Ethiopia.

The inhabitants of Ethiopia were of Semitic origin, and spoke a language called Geez, which showed greater affinities with the Arabic of the Sabaeans in S. Arabia than with classical Arabic. The alphabet was perhaps of Phoenician origin. There was an Ethiopic version of the Bible, including various apocryphal books added to both the O.T. and the N.T. Geez was superseded by Amharic as the official language, but continued to be used in the churches and in literature. It is now represented by two dialects, Tigre and Tigrai. See Abyssinia.

**Ethmoid Bone** (Gr. *ethmos*, strainer, sieve; *eidos*, form). Bone which projects downwards from the frontal bones of the head. It enters into the formation of the floor of the cranium, the orbits or eye-sockets, and the deeper parts



Ethmoid Bone. Left, front view of the bone; right, side view

of the nose. Roughly cuboid in shape, it is of a spongy, porous consistency, a very complicated structure, and contains a number of small cavities.

**Ethnography** (Gr. *ethnos*, nation; *graphein*, to write). Branch of ethnology (*v.i.*), which comprises the study and description of various social groups, in reference to their distinctive material characteristics.

## ETHNOLOGY: STUDY OF PEOPLES' LIVES

H. J. Fleure, D.Sc., F.R.S. Author of *The Negro and His Characteristics*

*The different ways in which peoples in various parts of the world, and at varying stages of development, conduct their society are studied in ethnology. Cognate subjects are Anthropology; Family; Tribe. See also articles on American Indian; Celt; Slav; and other human groups*

Ethnology is the science which studies the lives of the peoples. The modes of life among mankind have developed, with many diversifications, from a general original dependence on the collection of food—nuts, fruits, some leaves, probably small animals, honey, manna, shore animals, fish, etc. Hardly any peoples, if any at all, have remained at this primal stage. In the Old Stone Age, probably hundreds of thousands of years ago, man learned to stand erect and to preserve, if not at first to make, fire. With these advances he became a hunter, making pitfalls and later developing spears and arrows for action at a distance; the women and children and those unable to run with the hunters meanwhile went on collecting.

The surviving hunter-collectors include the Australian aborigines, some Bushmen of S.W. Africa, pigmies of the African equatorial forest, the people of the Andamans, forest people of a few spots in India, Malaya, and some of the islands off S.E. Asia. The Eskimo are functionally akin to these groups as are several groups of American Indians, but probably their case is more complex. This mode of life requires usually more than 1 sq. m. per person, and groups are typically small with little differentiation of rank or function, but with joint action

by a number of men who collectively resent intrusions of other groups into the territories over which they habitually range. Present day hunter-collectors are but lingering groups, usually in unfavourable environments (desert or damp hot forest), remnants of an old order that has nearly passed away, usually wandering considerably, though the Eskimo may make durable winter houses of stone and return to them, and some S.W. Africans have a group of huts arranged around a dancing floor or ceremonial space. There may be some council of heads of families, some scheme of initiation of, at any rate, the boys into the work of hunting, and into marriage, which may be polygynous if a man is prosperous enough. Customary taboos affect the choice of a wife and are often said to be aimed at avoidance of very close inbreeding, though this is not always very accurately secured.

### In the Old Stone Age

The hunting-collecting mode of life was characteristic of the Old Stone Age, late in which, perhaps less than 100,000 years ago, desert areas increased in N. Africa and S.W. Asia, and peoples there were driven to the neighbourhoods of the Nile, Euphrates, etc., where the care of seed-yielding grasses (cereals) evolved among the women as a supplement to collecting—

here we have the basis of the story of Eve. Cultivation probably began before 5,000 B.C. Use of stone for hoeing brought forth the idea of rubbing stones to shape them, and soon of cracking them and softening some (metallic ores) in the fire. Thus a Neolithic, cultivating phase evolved as a preliminary to the dawn of metallurgy. Cultivation with the hoe, chiefly by women and enslaved men, was supplemented by spade cultivation, more particularly as work for men, and by ditch digging on the flood plains of the rivers as they became cleared of bush. Thus cultivation brought an increasingly settled life, and among the early cultivated plants were spelt-wheat, emmer-wheat, barley, millets, and probably some fleshy roots and bulbs as well as perhaps some beans.

To Africa south of the Sahara there spread the cultivation of millets, beans, and some roots, supplemented later by banana-growing, introduced from Asia, but few flood plains were available and cultivation has typically been in bush clearings which become exhausted after a few years and need time to recover. The group of cultivators resents the intrusion of other groups into an area it is using or is likely to use; and usually the elders, or a chief, may hold the land and give permission to members of the group to clear and use a patch, or a patch for each wife if the man has more than one. Individual or negotiable property in land is outside most African peoples' native experience.

### Domestication of Animals

In Egypt, Mesopotamia, and some other parts of Asia cultivators early learned to domesticate animals, first the dog, then the calf, lamb, pony, and so on, and through the young their mothers also, and gradually the goat, pig, dromedary, and Asiatic elephant as well as, more or less, the cat. The male young of cattle, sheep, etc. made difficulties in the herds until men learned to castrate the surplus and to make them help in farm work, especially in ploughing—work in which the females also were and still are used.

Plough agriculture spread from S.W. Asia and Egypt over Asia and Europe, but very little into Africa. There the native grasses grow rank and coarse, poor in vitamin C, and cattle are of poor quality, often kept as a medium of exchange, especially for acquiring a wife from another group or

sub-group (this is said to be for "lobola," i.e. compensation of the woman's original group for the loss of her work when she goes into her husband's group).

Absence of ploughs, of manuring, of care of the soil, of working animals, as well as of towns, written records, institutional priest-hoods, is a feature of Africa, S. of the Sahara, with an exception to the general rule in a few cases in W. Africa. The concept of a state is little developed, save in Uganda and here and there in W. Africa. The concept of a spiritual power indwelling in a particular object, called a fetish, is widespread and should be contrasted with the idea of the sanctity of a class of objects or living things (a kind of tree or animal) found in many other regions. The village in Africa occasionally lasts for a generation or less, the people moving to a new site; the arrangement of dwellings and storehouses, etc. in the village may follow custom elaborately. Defeated and broken groups take refuge in the hot, wet forests, often at the cost of their animals, which die there from tsetse and other pests.

African food was revolutionised after contacts with America following the discovery of that continent by Europeans. Maize, manioc, sweet potato, tomato, were among the chief additions to the African menu, but varieties of yam and bean may have come in, too. In the last hundred years Europeans have penetrated everywhere in Africa, and the old order, already undermined by Arab and European slave traders, faced with a final crisis, must make adjustments (acculturation) and come into the world of commerce.

#### Hoe and Stick Agriculture

Though plough agriculture had spread to Java and the Philippines, and here and there beyond, before Europeans dominated the Pacific lands, the older agriculture of hoe and digging stick remained in the farther islands of Indonesia, Papua, Melanesia, and Polynesia, where yams, sago, taro, coconut, are all sources of food, along with pig and shore animals and fish. Cannibalism was partly ceremonial (to secure vital essence) and partly a means of keeping population within limits. Boat construction, little practised in Africa, was very highly developed by the Polynesians, who made voyages to Hawaii and New Zealand. It was accompanied by

skill in wood carving, in making tapa cloth (by hammering vegetable tissues together), and in several arts, some of which have been lost.

European intrusion brought disease and general decline of the old life, probably much accentuated by further penetrations during the war of 1941-45; and some groups, especially in Melanesia, are said to be dying out. The Maori of New Zealand, after a phase of decline, have adapted themselves remarkably and are increasing, having survived, not only their move to New Zealand some six centuries ago, when they had to give up a good deal of their former agriculture and find new foods, but the settlement of Europeans in their islands. Maori art (especially in wood) reveals a high quality. A social hierarchy is more developed in Melanesia and Polynesia than in many parts of Africa S. of the Sahara and Abyssinia, and Pacific methods of expressing relationship and marriage rules are subjects of study of great importance to the understanding of social structure.

#### Complexities of a Mixed Population

Some cultivators of the Melanesian islands are perhaps survivors of the root and tuber phase of cultivation, but the passage of Polynesians along the N. of Papua and through the Melanesian islands from Indonesia out into the Pacific has greatly influenced the life of the region. Polynesian skill in stone grinding (making Neolithic implements) is a marked feature, and inter-insular exchanges of goods are notable. It seems that many old types of skill have disappeared among small isolated groups. Indian infiltration (chiefly from S. India) in Fiji; Japanese, Chinese, and others in the Sandwich Is.; S. Arabian and Chinese in Indonesia; Dutch following Portuguese, especially in Java and Sumatra, but also in Indonesia generally; Spanish in the Philippines; British here and there, and notably (especially Scots) in New Zealand; and American in the Sandwich Is. and Samoa make the present population of the Pacific very complex socially as well as physically.

The Americas received drifts of population from N.E. Asia from late interglacial phases onwards into the Neolithic phase, but the crops and animals of farmers from the Old World did not survive the transit. Many of the pre-Columbian peoples of America

were restricted to a life of hunting and collecting or fishing, but nevertheless possessed Neolithic tools and weapons, skill in grass weaving and often in decorated pottery and modelling which in the Old World seem associated with agricultural life. In America man found food plants, notably maize, manioc, sweet potato, potato, tomato, and plantain-banana as well as varieties of palms, and America thus attained a considerable degree of equipment and settled life, with cities, calendars, states, etc., in the case of Mexico and Peru. In Peru the llama was domesticated, the only animal apart from the dog and the turkey to be tamed by man in America. It is just possible that some small groups may have drifted to America across the Pacific, but theories of pre-Columbian American life based on this supposition have on the whole failed to make themselves acceptable to expert opinion.

The Eskimo of the Arctic north are a unique case of highly specialised adaptation to a region where cultivation and herding are impossible; their skills far exceed those of most other hunter-collectors. The Eskimo and the pre-Columbian peoples of America N. of Mexico have been greatly reduced in numbers by European intrusion. In Mexico and Central and S. America, intermixture between Europeans and the earlier peoples has been much more general, and a large element of the latter survives, though their old social organization has been displaced by a system based on that of Spain and Portugal in the 16th and 17th centuries.

#### Introduction of Slave Labour

The introduction of negro slaves into Brazil, the W. Indies, and the U.S.A., and of Indian plantation labour into Guiana and Trinidad, has added further complications. Pre-Columbian forms of society survive only among relatively few groups, and then probably not unmodified, in British Columbia, the arid regions of S.W. U.S.A. and some spots in Central and S. America, notably on the plateaux of Brazil. A form of metallurgy had developed in pre-Columbian America, in Peru, more than elsewhere.

The region of traditional plough agriculture in the Old World comprises Europe, N. Africa, and most of Asia, in the damp areas (monsoon lands) of which rice is a leading crop. In the plough region there has been a sequence



of technical evolution from stone to copper and bronze and then to iron and steel and power machinery, with rise of cities, development of social hierarchies, spread of the horse as a factor of power, founding of priesthoods and growth of judicial and administrative systems, introduction of coinage as a vital factor in exchange, literacy and written records, organized war and conquest, all of which are studied as history, economics, psychology, geography, etc.

In that development the activities of the men of the great arid belt, which, with river breaks, stretches from the Atlantic coast of the Sahara to the Khingan mountains of Manchuria and beyond, have played a notable part. Most of the peoples of this belt cultivate fertile patches near rivers or other good sources of water; but, on the fringes of these areas of settlement and beyond them, there were, and in some places still are, groups which wander with herds in search of pasture. They usually depend for some food on the settled cultivators; and they are best looked upon as specialised groups who have detached themselves, more or less, from cultivation rather than as direct developments from hunter-collector groups. Nomad herdsmen, especially since they came to ride horses, have been noted for mobility and for their power of short-term organization and discipline for raids. They have again and again irrupted into settled areas, conquered the cultivators and formed themselves into an aristocracy. They have typically fused into the general settled population through intermarriage.

Ethnology thus studies the modes of life of the world's peoples, systems of land tenure and land use, crops and agricultural routines, care of soil, of domestic animals, systems of relationship and of marriage among peoples, types of settlement, social hierarchies, systems of education and ceremonies connected with major incidents in a person's life, schemes of government and administration. The term ethnography is best used for descriptions of particular groups in these and allied aspects, and ethnology may be reserved for the comparative study of groups with a view to the elucidation of principles applicable over a number of cases; few if any will be generally applicable. It must be realized that some scheme

of marriage, some expressions of the power quest, some form of education, some making of implements, some ceremonial, are found in every human group, and that group-life is a part of man's heritage from pre-human ancestors.

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**Ethyl.** Name given to the chemical group  $C_2H_5$ . There are many compounds containing this group, the names of which often begin with the word ethyl. Ethyl Acetate,  $CH_3COOC_2H_5$ , is a colourless liquid with a pleasant smell, boiling at  $78^\circ C$ , obtained by distilling a mixture of alcohol, acetic acid, and sulphuric acid; it is used in the preparation of fruit essences. Ethyl Chloride  $C_2H_5Cl$ , is a colourless gas boiling at  $12.5^\circ C$ , used as a local anaesthetic; it is made by distilling alcohol with hydrogen chloride (hydrochloric acid) and zinc chloride and condensing the vapours by a freezing mixture. Ethyl Nitrite,  $C_2H_5NO_2$ , is a liquid, boiling at  $17^\circ C$ ; a constituent of sweet spirit of nitre, which is an alcoholic solution of ethyl nitrite and other substances. Lead Tetraethyl,  $Pb(C_2H_5)_4$ , is a liquid, boiling at  $92^\circ C$ : when this compound is mixed with petrol used for internal combustion engines, it prevents the premature explosion known as knocking. By the thermal dissociation of lead tetraethyl the free radical ethyl was obtained by Paneth, but it has only a momentary existence as it readily combines with another ethyl group to form butane,  $C_4H_{10}$ . For Ethyl Alcohol, see Alcohol.

**Ethylamine.** Organic base with an ammoniacal odour, burning taste, and strong alkaline character. It is liquid, behaves in most respects like ammonia, and is used in the manufacture of some aniline dyes. First prepared by Wurtz, 1848, by distilling cyanic ether with caustic potash, ethylamine is now made by Hofmann's process, in which crude ethyl chloride, a by-product in the manufacture of chloral, is acted on by ammonia. This produces diethyloxamide, which, purified and distilled with caustic potash, yields ethylamine.

**Ethyl Cellulose.** Chemical product. Although cellulose esters have been known for almost a century, it was only at the begin-

ning of the 20th century that attention was turned to the cellulose ethers, mainly by Suida, Lilienfeld, Dreyfus, and Hess. Of these substances ethyl cellulose has attained greatest success, and is widely used as a basis for plastics and coating compositions. It can be prepared by the repeated treatment of alkali cellulose with ethyl sulphate at  $50-55^\circ C$ ; seven such treatments giving an  $-OC_2H_5$  content of 55.2 p.c. as compared with 54.8 p.c. for the theoretical triethyl ether. According to patent literature, the more favoured commercial method appears to be treating cellulose suspended in 44 p.c. NaOH with excess ethyl chloride at temperatures up to  $100^\circ C$ .

The solubility of ethyl cellulose varies with the degree of ethylation. For plastics and lacquers the main commercial grade approximates to the di-ether with 40-48 p.c.  $-OC_2H_5$ , which is soluble in a wide range of organic solvents including the cheaper and readily available aromatic hydrocarbons. This wide selection of cheap solvents, coupled with the increased chemical resistance of this ether as compared with the competitive cellulose esters, has done much to contribute to its commercial success. The range of plasticisers for ethyl cellulose is unusually large, and includes, with two exceptions, all classes of materials which have been offered as flexibilising agents for coatings or plastics. Ethyl cellulose is also readily compatible with a wide range of natural and synthetic waxes. The general effect of addition of ethyl cellulose is to increase the melting point and to toughen the material, to reduce the tendency of waxes to crystallise, and to reduce tackiness of tars and pitches.

V. E. Yarsley, D.Sc.

**Ethylene** ( $C_2H_4$ ). Colourless gas prepared by the action of sulphuric acid on alcohol, and purified by passing through sulphuric acid and caustic soda. It was first investigated, 1781, by the Dutch chemists, Deimann, Paets van Troostwyk, Bondt, and Lauwerenburgh. It is also known as heavy carburetted hydrogen, elayl, and ethene. It is easily inflammable, burns with a luminous flame, and forms an explosive mixture with air or oxygen.

**Ethyl-hydrocupreine.** A derivative of cupreine, an alkaloid occurring in cuprea bark (*Remijia pedunculata*).

**Etiolation.** The term used in plant physiology to describe a peculiar condition which appears

in normally green plants when they are grown in darkness. The plants are pale yellow where they would normally be green and in most instances their stems are abnormally long, their leaves unusually small. Internally there is a relatively scanty development of lignified tissue elements. It is probable that etiolation results, in part at least, from the modification by lack of light of the auxins controlling growth processes.

**Etymology** OR AETIOLOGY (Gr. *aitia*, cause; *logos*, account). The doctrine of causes, of the origin of things, specially applied to the origin of diseases. By some it is classed with ontology and teleology, as a branch of metaphysics (*q.v.*).

**Etiquette**. French word introduced into English to denote a routine of behaviour established by custom. It includes court ceremonial, formalities of diplomatic intercourse, procedure in parliament, in the army and navy, etc.; rules of behaviour in social intercourse; and the code observed by professional men, especially doctors and lawyers, for safeguarding the dignity and interests of their profession. Of all peoples the Chinese attach the greatest importance to etiquette. From remote times they have codified their ceremonial, and the Book of Rites, though relatively modern dates from the 1st century B.C. Many books of etiquette rules are published in Great Britain and the U.S.A.

**Etive**. River and sea-loch of Argyllshire, Scotland. The river issues from Loch Mathair Etive and flows 15 m. S.W. to the head of Loch Etive. The loch extends 10½ m. S.W. and then 8½ m. W. to the Firth of Lorne. There are interest-

ing ruins on its shores. The river is noted for its salmon and trout, and for its magnificent scenery.

**Etna** (Lat. *Aetna*; Sicil. *Monte Gibello*). An active volcano, situated near the E. coast of Sicily, and the loftiest in Europe. Its present alt.,

10,755 ft., shows a decrease of 115 ft. since 1861. The base covers an area of about 460 sq. m., and has a circumference of 90 m., while the floor of the crater, which constantly alters and has become wider in recent years, is 9,765 ft. above sea level. In the distance Etna presents the appearance of a huge symmetrical cone, but on closer observation discloses an irregular surface, studded with some 200 minor cones, attaining 3,000 ft. in height, and broken on the E. side by the Valle del Bove, a gaping abyss from 2,000 to 4,000 ft. deep. Its slope comprises three distinct



Etive. The Argyllshire loch, famous for its salmon and trout fishing

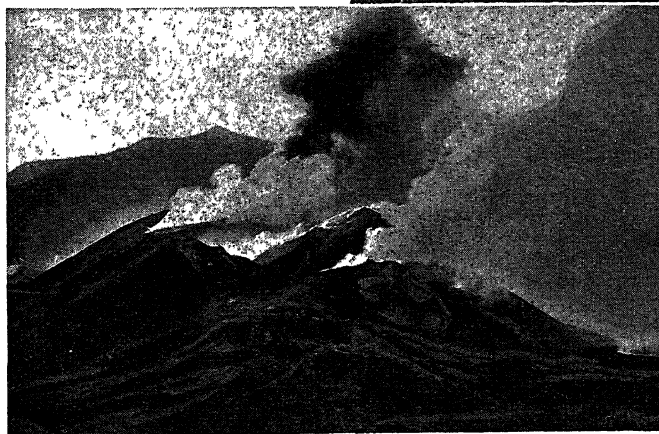
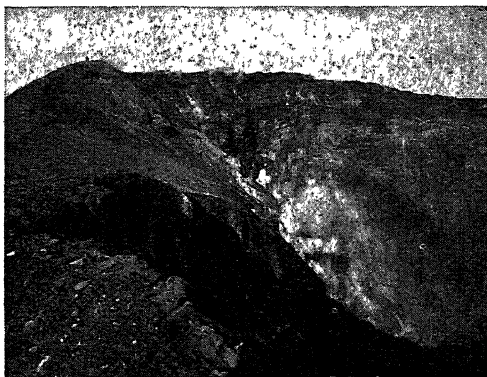
zones of vegetation. The lower, or lava, region rises 3,000 ft. from the base, and is thickly populated and well cultivated; the middle, or wooded, region, between 3,000 ft. and 6,850 ft., is covered with forests of pine, birches, and other trees; the upper, or desert, zone is a barren waste, under snow during most of the year. Pivot of the main Axis defence line in Sicily during the campaign of 1943, the mountain was wholly in Allied hands by Aug. 14, after heavy fighting in the foothills.

The ascent is generally made from Catania or Nicolosi, and 1,100

ft. from the summit is an observatory, with accommodation for tourists. Pindar describes an outbreak in 476 B.C. Violent explosions occurred in 1169, 1527, 1669, 1693, 1792, 1830, 1852, 1865, 1879, 1886, 1892 (when a new crater was formed near Monte Gemellaro), 1899, and 1910. The eruption of 1169 partly destroyed

Catania, and that of 1693 caused enormous loss of life. Among over 80 recorded activities, recent eruptions took place in 1914 and 1928, when the town of Mascati was wiped out. Legend connects the volcano with the giant Typhōn, who is said to have been buried beneath it by Zeus, and to have caused its eruptions by his heavy breathing; and with the workshops of Hephaestus (Vulcan), wherein the Cyclopes fabricated thunderbolts.

**Eton**. Town and parish of Buckinghamshire, England, on the left bank of the Thames, opposite Windsor. Part of the parl. div. of Eton and Slough, it is 21 m. W.S.W. from London. Dating from Anglo-Saxon times, it has a church in Early Decorated style dedicated

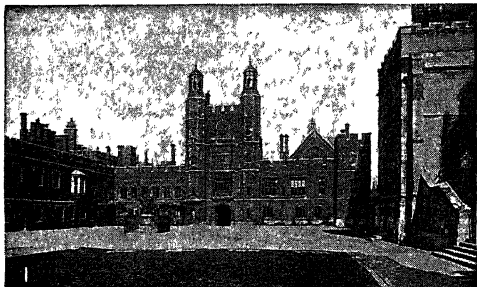


Etna. This volcano near the east coast of Sicily is still active, and the lower photograph shows it in eruption. Top, closer view of the crater

to S. John the Evangelist, 1852-54, and a noted inn, the Christopher. Pop. 4,050.

**Eton College.** English public school. Founded by Henry VI as the College of the Blessed Mary of Eton beside Windsor, and now known as the King's College of Our Lady of Eton beside Windsor, its first charter is dated 1440. A supplementary charter

Eton College arms was granted in 1441, when the buildings were begun. The original constitution (based upon that of Winchester, 1382) provided for a provost, head master, 10 fellows, four clerks, six choristers, 25 poor scholars, and 25 bedesmen. Henry Sever was the first provost, succeeded by William of Waynflete, 1443. Among the heads have been Nicholas Udall,



1505-66, John Keate, the famous flogger, 1773-1852, J. J. Hornby, 1826-1909, Edmond Warre, and Cyril Alington. Arms were granted to the College in 1449.

The founder's statutes were formally repealed in 1871. The foundation now consists of the provost, appointed by the crown, 10 fellows, who form the governing body, vice-provost, head and lower masters, one or more bursars, and two chaplains or conductors. The number of collegers (or Tugs) is 70. In 1947, in addition to the college proper, there were 25 houses and over 1,100 king's scholars and oppidans or house residents. There are 87 masters. Notable scholars have included Bolingbroke, Boyle, Canning, Chatham, Fox, Gladstone, Gray, Hallam, Kinglake, Milman, Peel, Porson, Pusey, Shelley, Swinburne, and Wellington, whose remark that Waterloo was won on the playing-fields of Eton has been explained as a reference to the fights that took place there. Ironically, these same famous playing fields were selected in 1940

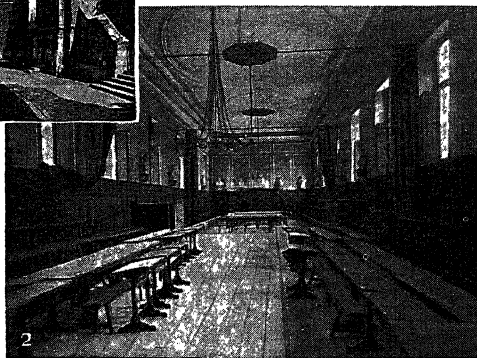


Eton. The town, seen from Windsor; in the centre is the college chapel

as the chief assembly point for evacuated government officials moving from London in the event of a German invasion of Great Britain.

Of the buildings, the hall, 1448, restored 1858, is the only part built according to the founder's final plan. The Perpendicular chapel, 1442-80, originally parochial as well as collegiate, resembles that of

King's College, Cambridge, and was restored in 1848-60. The old buildings, of dark red brick, with stone dressings and clustered chimney



shafts, form three sides of a quadrangle, which is completed by the chapel. Restoration of the vestry chapel was part of the First Great War memorial. The library was built in 1729, and new buildings in 1844-46 and 1885-87. In athletics the wall game is a special feature, and the rowing boys are known as "wet bobs," the cricket-

ers as "dry bobs." The school gives its name to the stiff collar and short jacket worn by boys.

**Bibliography.** Annals of Eton, W. Sterry, 1898; Fasti Etonenses, A. C. Benson, 1899; H.st. of Eton College, L. Cust, 1899; Eton, A. Clutton-Brock, 1900; History of Eton College, H. C. Maxwell Lyte, 4th ed. 1911; Eton College, C. E. C. Hussey, 1922.

**Étoudi, L'; or LES CONTRETEMPS** (The Thoughtless; or The Mishaps). Five-act comedy by Molière. The scene is laid in Messina. The title refers to the character Léliu, who is often doing the wrong thing from right motives. His rascally servant Mascarille is the life and soul of the play, which was first produced at Lyons, 1653.

**Étretat.** Town and watering-place of Normandy, France, in the dept. of Seine-Inférieure. Facing the English Channel, 16 m. N.N.E. of Havre, it became a popular holiday resort in the latter part of the 19th century. The chief building is the Romanesque church of Notre Dame, dating in part from the 11th century. There are public gardens, a casino, and ample bathing facilities.

**Etruria** (Gr. *Tyrrhēnia*). Ancient district of Italy nearly corresponding to the modern Tuscany. To what race its inhabitants, variously called by the Romans and themselves



Eton College. 1. The School Yard and Lupton's Tower, built in the 16th century. 2. The Upper School, built 1690-91. 3. The Hall, one of the original buildings of Henry VI, restored in 1858

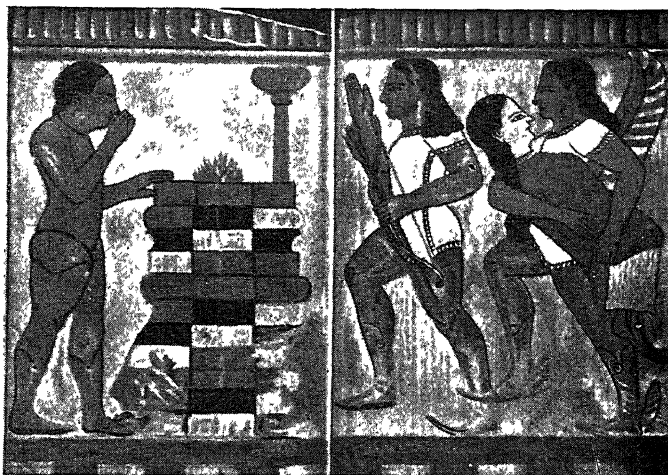
Tusci, Etrusci, or Rasenae, and their language belonged are problems yet unsolved. They were a warlike and enterprising people, whose power, at its height during the 7th century B.C., began to decline two centuries later. The chief authority was in the hands of an aristocratic caste called *lucumones*; the 12 principal cities were confederated, with a general council controlling matters of peace and war. They early came into contact with Rome, whose Tarquin kings were of Etruscan origin, and in 285 finally submitted to her yoke.

There is abundant archaeological evidence that the Etruscans were a wealthy, highly civilized people. Although their architecture was mainly borrowed from Greece and the East, it exhibits a certain originality. Above all, they were the first to make practical use of the principle of the arch, as in the bridges at Chiusi (*q.v.*). Their walls, unattached by cement, consisted of large blocks of stone, sometimes rectangular, sometimes roughly hewn. The Servian wall at Rome was of Etruscan construction. The tombs, all subterranean, differ according to periods and the condition of the soil. In mountainous districts they were usually chambers hewn out of the rock. Where the soil was yielding and crumbly they took the form of a *tumulus*, a conical earth-mound erected on a walled substructure, frequently having a pear-shaped ornamental top, *e.g.* the so-called tomb of the Horatii and Curiatii at Rome. The walls of the grave chambers were often adorned with paintings.

In their plastic arts, three stages have been distinguished—Egyptian, Etruscan, and Hellenic. Special excellence was shown in the preparation of clay vessels adapted from Greek models, cinerary urns, and terra-cotta sarcophagi. Numerous specimens are extant of statues, from tiny *lares* (household gods) to colossal figures, such as the she-wolf of the Capitol; and of all kinds of vessels, candelabra, silver goblets, ivory, gold, and silver thrones, and ornamented weapons. Most of the sculpture is sepulchral.

It is perhaps in painting that the Etruscans achieved the greatest success, whether on the walls of the sepulchral chambers or on pottery. The painted vases also passed through the three stages of Egyptian (or perhaps archaic Greek), Etruscan, and Hellenic. In the first the figures are of a blackish brown, in the second black, in both cases painted on the yellowish-red ground of the clay; in the third, the ground is black, the figures red.

The Etruscan mirrors are well



Etruria. Paintings discovered at Cerveteri, the ancient Etruscan city of Caere, illustrating the ceremonial burning of the dead

By courtesy of Wm. Henemann

known—round or pear-shaped plates of bronze, the outer side polished and the inner adorned with figures. Some of them are very beautiful and more than anything else throw light on the national life. The Etruscans were skilled musicians, their national instrument being the flute. See *Archaeology*; consult also Manuel d'Archéologie Étrusque et Romaine, Jules Marthas, 1884; *Cities and Cemeteries of Etruria*, G. Dennis, ed. W. M. Lindsay, 1907.

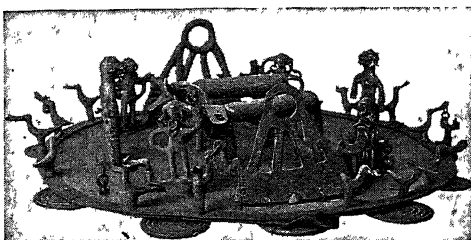
**Etruria.** Ecol. district and village of Staffordshire, England. It is within the city of Stoke-on-Trent, and has its own railway station. Josiah Wedgwood established his pottery works here in 1769. Etruria Hall, where Wedgwood died in 1795, has been converted into the offices of a large iron, steel and coal works. Pop. 9,580.

**Etruria Maris.** In geology, beds of red and purple marl and clay, occurring in the upper coal measure strata of the coal-basins of the Midlands and N. of England. They are used in pottery manufacture. See *Pottery*.

**Ettlingen.** Town of Baden, Germany. It stands on the Alb, 4 m. S. of Karlsruhe. The chief buildings are a castle, standing in large grounds, the town hall, several churches, and a monastery, now put to secular uses. It is still surrounded by walls and a moat. Its industries include the manufac-

ture of paper, dating from before 1500, textiles of various kinds, and machinery. A Roman station, Ettlingen was made a town in 1227 and has since been part of Baden. It is famous for the battle fought here between the French and the Austrians, July 9-10, 1796, the French being the victors. Pop. 10,000.

**Ettmüller, ERNST MORITZ LUDWIG** (1802-77). German philologist. Born at Gersdorf, Saxony, Oct. 5, 1802, he became professor of Ger-



Etruria. Plate of primitive Etruscan work ornamented with figures depicting a ploughing scene

British Museum

man literature at the Zürich Gymnasium, 1833, and professor at the university there, 1863. His writings contributed largely to the knowledge of early German, Anglo-Saxon, and Scandinavian literatures. His best known works are a translation of *Beowulf*, 1840, and a *Lexicon Anglo-Saxonium*, 1851. He died April 15, 1877.

**Ettrick Forest.** District of Selkirkshire, Scotland. Formerly a part of the Caledonian Forest which comprised Selkirkshire and portions of Peeblesshire and Midlothian, it was at one time a hunting ground of the Scottish kings. It is now almost denuded of its trees.

**Ettrick Water.** River of Selkirkshire, Scotland. It rises in Ettrick Pen and flows 32 m. N.E. to the Tweed, about 2 m. below Selkirk. In the churchyard of Ettrick parish are buried James Hogg, the "Ettrick shepherd," Thomas Boston, Puritan divine, and Tibbie Shiel (1782-1878), who kept the famous inn at the head of St. Mary's Loch.

**Etty, WILLIAM** (1787-1849). An English painter. Born in York, March 10, 1787, he was apprenticed to a printer in Hull. Coming to London, he began copying famous pictures, in 1806 entered the R. A. schools, and was a pupil of Lawrence. Between 1816 and 1824 he made several visits to the



*Wm Etty*

From a photo, 1849

Continent, chiefly to Italy, whence he returned with a fine sense of colour and of graceful composition. In 1824 he was elected A.R.A., and R.A. in 1828. He died in York, Nov. 13, 1849. Not until late in life did he obtain good prices for his work, probably owing to his preference for vast canvases. He excelled in the painting of the nude figure, though his literal treatment of it may still arouse distaste. Of his smaller pictures *Youth on the Prow and Pleasure at the Helm* in the National Gallery is the most popular. The nobility and dignity of his huge works, such as *The Combat* and the three *Judith* pictures at Edinburgh, and *Ulysses* and the *Sirens* in the Royal Institution, Manchester, compel admiration.

**Etymology** (Gr. *etymon*, true; *logos*, science). The investigation of the origin and meaning of words. The term dates back to the early schools of Greek philosophy, whose theories are ridiculed by Plato in the *Cratylus*, where he himself propounds some extraordinary derivations. The Stoics and Alexandrian grammarians also devoted much attention to the study of words and the parts of speech. Owing to complete ignorance of phonetic laws, the older etymologists laid down arbitrary and impossible sound changes, and even went so far as to derive words from others of opposite meaning, e.g. *lucus* (grove), *a non lucendo* (from not shining). In the Middle Ages the influence of

theology led to the attempt to derive everything from Hebrew as the parent of all languages.

Etymology as a science is of comparatively recent origin, and became possible with the introduction of a knowledge of Sanskrit into Europe by Sir William Jones. This led to a thorough examination of the vocabulary of the Indo-European languages and the establishment of certain fixed principles of sound-change which governed the changes in the form of a word in different languages.

What is called popular etymology is really false analogy, and is an endeavour to adapt the form of a word not directly intelligible to that of one more familiar and apparently related; e.g. *crawfish* (Fr. *écrevisse*), *wormwood* (Ger. *Wermuth*), *bridegroom* (A.S. *bride-gum*, *brideman*). See *Language*; *Philology*; *Place Names*.

**Eu.** Town of Normandy, France, in the dept. of Seine-Inférieure. It stands on the Bresle, 64 m. N.N.E. of Rouen. It has a few industries, flour mills, brickyards, and glass works among them, and a transit trade, but its main interest is historical. The church of S. Lawrence is a fine Gothic building of the 12th and 13th centuries, and the château, partly burned down in 1902, dates from the 16th century, when it replaced an older one. Louis Philippe, who restored it, often resided here. The name appears to be a derivative of Lat. *Augusta*.

**Euboea** (Turk. *Egripo*; Ital. *Negroponte*). A large island of Greece, in the Aegean Sea. It lies off the E. coasts of Boeotia and Attica, has a length of 115 m., a breadth varying from 4 m. to 32 m. and is separated from the mainland by a narrow channel called Euripus. The surface is mountainous with fertile valleys, pasturing large herds of cattle. Oil, wine, corn, fruit, honey, and pitch are produced, but stock-breeding is the principal occupation. The highest point is Mt. Delphi, 5,720 ft. The thermal springs of Euboea have been esteemed since ancient

times. The chief town is Chalcis. The island's history is merged in that of Greece and Rome. In medieval times it belonged to Venice. It was taken by the Turks in 1470, and in 1830 was restored to Greece. In 1941 it was occupied by Axis forces who were found to have evacuated it when British troops landed Oct. 23, 1944. Area 1,430 sq. m. Pop. 179,523. *Pron.* Ev-via.

**Eubulus** (d. 330 B.C.). Greek orator and demagogue. He was a friend of Aeschines, whose clerk he had been, and a violent opponent of Demosthenes. It was chiefly owing to him that Aeschines was acquitted when accused of treacherous dealings with Philip of Macedon. A decided pacifist, Eubulus carried a proposal that whoever suggested applying any portion of the theoretic or festival fund to any other purpose, such as war, should be put to death. In 346 B.C., negotiating with Philip, he concluded a peace highly disadvantageous to Athens.

**Eucaine**, **BETA-EUCAINE**, OR **BENZAMINE**. Artificially prepared alkaloid allied to cocaine. It is used as a local anaesthetic in the form of its salts, beta-eucaine hydrochloride or lactate, but has been largely superseded by newer agents of this class. It is safer than cocaine but less powerful.

**Eucalyptus** (Gr. *eus*, well; *kalyp-tos*, covered). Genus of trees of the family Myrtaceae. The name is given to it because the sepals cover thoroughly the unexpanded flowers. See *Gum*.

**Eucalyptus Gum.** Exudate of the red gum-tree of Australia. It contains tannic acid and is a powerful astringent, being used in lozenges or in gargles for relaxed throat, and occasionally prescribed in diarrhoea and dysentery. Eucalyptus oil is distilled from the *Eucalyptus globulus*, the blue gum-tree. It is used as an antiseptic and as an inhalation or spray for colds and in conditions accompanied by foetid expectoration. Mixed with an equal amount of olive oil it is rubbed in locally for rheumatism.

**Eucharis** (Gr. *eucharis*, pleasing). Small genus of bulbous herbs of the family Amaryllidaceae. Natives of Colombia, they have egg-shaped bulbs, broad, elliptical leaves with long stalks, and white flowers, from 3 to 5 ins. across. These are borne in clusters on top of a tall stem, and consist of a slender tube expanding into a cup surrounded by six sepals and petals.



*Eucharis amazonica*, a South American bulbous herb



**Eucharist** (Gr. *eucharistia*, thanksgiving). One of the names used from early times for the Sacrament of the Lord's Supper. The term occurs frequently in the N.T. in the general sense of thanksgiving, but for the most part without special reference to the Lord's Supper or Holy Communion. The special application of the word arose from the Gospel accounts of the Supper, in which Christ is recorded to have given thanks over both the bread and the cup. The Apostles followed His example, and thus the blessing or consecration of the elements became known as a eucharist or thanksgiving. Later the

tions prefer the primitive name of the Lord's Supper.

As the central act of worship, the Eucharist has been the cause of much embittered controversy. The history of Eucharistic doctrine exhibits two main points at issue: (1) the nature and method of the presence of Christ in, or associated with, the consecrated elements; (2) the sacrificial aspect of the service. From comparatively early times it was held that after the act of consecration, the Body and Blood of Christ are really and substantially present, and "are verily and indeed taken and received by the faithful in the Lord's Supper."

But in defining the method of the mysterious Presence, wide differences of opinion arose.

Throughout the Western Church the doctrine of Transubstantiation became, in the course of time, a matter of faith. This taught that the substance of the elements was changed into or replaced by that of the Body and Blood of Christ, so that only the accidents or appearance of the bread and wine remain. Consubstantiation taught that both substances are present as a compound substance. At the Reformation, Transubstantiation was generally abandoned by Protest-

of the sacrifice of Christ on Calvary, but not a repetition of it. The various Protestant churches altogether reject the sacrificial idea.

In primitive times the Eucharist was celebrated in the evening, but from the time of Trajan it began to be a morning service. This practice has prevailed ever since, except in the Free Churches, and is connected with the ancient custom of receiving the Communion fasting. At first the celebration of the Eucharist followed the Agape (*q.v.*) or common meal, and was probably held daily. Later on the two were separated, and as a rule the Communion service was held on Sundays and Festival days. There is evidence that in some of the larger churches daily celebrations took place, but this was not the general custom. Originally all the faithful communicated at each celebration, the catechumens, penitents, and strangers withdrawing before the consecration; but as the sacrificial aspect became emphasised, the practice of non-communicating attendance became common, all the faithful attending each service, but only communicating occasionally or on obligatory feasts.

Except the Church of Rome, all Churches from Apostolic days have given Communion to the people in both kinds. In the Roman Church the cup has not been given to the laity through fear of accidents since the 14th century; while in the Greek Church the consecrated bread is dipped in the cup, and the elements are thus given together. Throughout the Western Church unleavened bread has been used; but this practice has not been adopted by the Eastern Churches. In the Anglican Church either kind of bread is permissible. The practice of adding water to the wine is general, except in Protestant churches, on the ground that the cup was thus mixed at the Passover.

The reception of Holy Communion is a condition of membership throughout the Christian Church. The Roman Church requires at least one annual participation at Easter; the Anglican Church fixes three times a year, Easter to be one, as the minimum. *See* Communion; Consubstantiation; Mass; Real Presence; Sacrament; Transubstantiation.

**Eucharistic Congress.** A meeting, at first local, but subsequently of an international character, attended by R.C. ecclesiastics and laymen, and held at intervals normally of one year. The first was at Lille in 1881. That held in London in 1908 was regarded as being of special importance.



Eucharist. S. Benedict celebrating Mass, from the painting by Sebastiano Ricci (1662-1734) in the academy of S. Fernando, Madrid

consecrated elements themselves became known as eucharistia, and the service itself was called the Eucharist, as being the Christian sacrifice or offering of thanksgiving and praise.

The Eucharist is the act of united worship directly commanded by Christ Himself in the words, "Do this in remembrance of Me." It has always been the central act of Christian worship in all the churches, save in a few bodies, such as the Quakers and the Salvation Army. In the early Church it was commonly called the Oblation or Liturgy, as it is still in the Eastern Churches. The Roman Church styles it the Mass, the Anglican Church Holy Communion, while most of the Protestant denomina-

ant bodies; but no one theory took its place. The Lutheran view was nearly identical with Consubstantiation; the Anglican Church maintained the Real Presence, but without defining its method; and most other reformed churches adopted the view of Calvin that there is no Real Presence in the elements themselves, but simply a spiritual presence of Christ in the souls of the faithful.

As regards the sacrificial aspect, the Roman Church teaches that in the Eucharist there is a "true and proper" sacrifice of Christ, Who is offered to the Father as a propitiation for both living and departed. The Eastern and Anglican Churches recognize a perpetual memorial or pleading before God



**Euchlorine** (ClO<sub>2</sub>). Yellow gas formed when potassium chlorate is treated with hydrochloric acid. First prepared by Davy in 1815, it was thought to be a new oxide of chlorine, but is merely a mixture of chlorine and chlorine dioxide. An efficient disinfectant, it is sometimes used instead of chlorine.

**Euchre**. Game played with 32 playing cards, the 2, 3, 4, 5, and 6 of each suit being thrown out. There are two players, or four in partnership. The dealer gives five cards to each player, three at a time and then two, turning up the next face upwards on the pack for trumps. The knave of trumps, the "right bower," is highest card, the other knave of the same colour, the "left bower," coming next. The remaining cards of these two suits, and all those of the other suits, rank from ace (top) to seven.

In the two-handed game the non-dealer begins by deciding whether he shall play or pass. If satisfied that he can win the odd trick he says, "Order it up." His opponent then puts one card face downwards on the table and is entitled to the card turned up for trumps, but generally leaves this card until he wishes to play it. Should the non-dealer be dissatisfied, he passes; the dealer may then either take up the top card in exchange for one of his own, and play, or he may pass also. Both having passed in turn either player has the chance of going on any other suit he chooses to make trumps. If both pass again, the hands are thrown in.

Two cards constitute a trick. A player must follow suit if he can but need not take a trick unless a higher card is his only play in that suit. The game is five up. If the player ordering up succeeds in making five tricks he wins a *march*, and scores two points; if three tricks, he makes the point, and scores 1 (four tricks count the same as three). If he fails to make three tricks he is euchred, and his opponent scores 2. *Pron.* U-ker.

**Eucken**, RUDOLF CHRISTOPH (1846-1926). German theologian and philosophical writer. Born Jan. 5, 1846, in E. Friesland, he was educated at Göttingen and Berlin. He was professor of philosophy at Basel from 1871 to 1874, then until 1920 at Jena. He died Sept. 14, 1926. His views and writings show the influence of Plato and the elder Fichte. He upholds the Christian standpoint, and is the opponent of naturalism in all its forms, whether as empiri-

cism, positivism, or utilitarianism. His chief works translated into English are: *The Fundamental Concepts of Modern Philosophic Thought*, 1880; *The Problem of Human Life*, 1909; *Christianity and the New Idealism*, 1909; *Life, Work, and Travels*, 1922. *Pron.* Oyken.

**Euclase** (Gr. *eu*, well, *klasis*, breaking). Rare mineral consisting of basic silicate of beryllium and alumina. Occurring in short prisms, with a perfect cleavage it is either colourless, yellowish, green, or blue. Occasionally cut as a gem-stone, it resembles aquamarine or topaz. It is found in Minas Geraes, Brazil, in the Ural mts., Austrian Alps, etc.

**Euclides** (fl. 300 B.C.). Greek mathematician, whose more familiar name is Euclid. Little is known of his life except that he was of Greek descent, and lived and taught at Alexandria. His individuality has indeed been so merged in his works that medieval writers attempted to prove that he never existed. Besides the *Elements of Geometry*, Euclid wrote *De Divisionibus*, a collection of 36 problems on the division of areas, possibly the only survivor of many such collections.

**Euclides** (d. c. 374 B.C.). Greek philosopher. A native of Megara he founded the Megarian school, one of the so-called imperfect Socratic philosophical schools. He held that there was only one good (Reason, Truth), and only one virtue (a knowledge of this good) all else being non-existent—a Socratic modification of the Eleatic doctrine of the Absolute One.

**Euclid**. Text-book on the elements of geometry, based upon the work of Euclides (*q.v.*). The course in elementary mathematics in vogue during the latter portion of the 19th century unwittingly introduced the student to a set of brilliant exercises in deductive logic in the guise of Euclid as an introduction to geometry. Many pupils never surmounted the Pons Asinorum (Euclid I), others managed by a sheer exercise of memory to master Book I, but only the comparatively select few succeeded in enjoying Books II to IV.

Euclid has been discarded by schools for two main reasons it is unsuitable to students of school age because it is entirely deductive; it is almost valueless as an introduction to current geometry since it ignores measurement and constructive movement, both dominant in modern concep-

tions, to which Riemann's system of geometry is more applicable. *See* Geometry; Riemann, G. F. B.

**Euclite**. Crystalline granular rock, a variety of gabbro. It is characterised by the presence, among mineral constituents, of basic species of feldspar. It is well developed in Tertiary eruptive rock in the Isle of Rum, Scotland and near Carlingford, Eire.

**Eudaemonism** (Gr. *eudaimonismos*). Greek term for the theory that happiness (*eudaimonia*) is the chief end of life. This happiness, according to Aristotle, must be striven after for its own sake, not as a means to an end, and is defined by him as a perfect activity in a perfect life. The most excellent and specially human activity is that of the reason; happiness therefore is to be sought in a contemplative, otherwise a virtuous, life. Eudaemonism is to be distinguished from Hedonism (*q.v.*).

**Eudiometer** (Gr. *eudia*, fine weather; *metron*, measure). Instrument used for measuring volume changes in chemical reactions between gases. Originally designed for determining the amount of oxygen contained in a sample of air, it is now commonly used for determining the constituents of a gaseous mixture. In some forms it comprises a graduated glass tube or cylinder, either straight or U-shaped, closed up at one end and open at the other, and having inserted near the closed end two platinum wires, which are near enough to allow the passage of an electric spark through the mixture.

A Cavendish eudiometer is a vessel closed at both ends, having a screwed connexion by which it can be pumped clear of air before being filled with a gaseous mixture for analysis. A mixture of two volumes of hydrogen and one of oxygen can be exploded in a eudiometer tube to form water.

**Eudocia** (c. 393-460). East Roman empress. Daughter of the Athenian philosopher Leontius, celebrated for her beauty and intellect, she was converted to Christianity by Pulcheria, sister of Theodosius II, the latter marrying her in 421. Before conversion her name was Athenais. The two sisters-in-law, however, quarrelled over the Eutychian heresy (*see* Eutyches), and Eudocia was banished, returning to a life of good works at Jerusalem. She wrote several poems.

**Euganean Hills**. Isolated group of hills in N.E. Italy, in the prov. of Padua. Lying in the W. of the prov., they are of volcanic origin.

have numerous thermal springs, and extensive trachyte quarries. The loftiest point is Monte Venda, 1,895 ft. On their slopes are several villas and a ruined convent. They gave the title to some lines written by Shelley in 1818.

**Eugene.** City of Oregon, U.S.A. the co. seat of Lane co. It stands on the Willamette river, 125 m. S. of Portland, 50 m. from the Pacific, and is served by rly. and airport. It is the seat of the Oregon university (opened 1872). It has flour and lumber mills, brick and tile works, rly. shops, and fruit-packing plants. Eugene is at the head of navigation, and carries on a brisk trade in lumber, cereals, cattle and animal products, and canned fruit. It is a rapidly growing city, settled in 1854, and incorporated 10 years later. Pop. 20,838.

**Eugene** (1663–1736). Italian prince and Austrian soldier. Born in Paris, Oct. 18, 1663, his father was Eugene Maurice, prince of Savoy, and his mother a Frenchwoman, a niece of Mazarin. He was baptized François Eugène. Educated in France, at first for the church, he entered the Austrian army, as Louis XIV would not admit him to the French, a fact which some think gave a distinct anti-French impetus to his military career. His early experiences were gained fighting against the Turks, and his advance was rapid in his profession.

In 1691 Eugene held a command in Italy, where by 1693 he had won several successes over the French. In 1697, in command of the imperialists in Hungary, he crushed the Turks at Zenta. In 1701, when the War of the Spanish Succession broke out, he was sent to Italy, where again he won considerable successes over the French. In 1704 began the association with Marlborough which has linked together the two names in history. The prince helped in the battle of Blenheim, but when Ramillies was fought (1706) he was again in Italy where his outstanding feat was the capture of Turin. He fought at Oudenarde, but after the English had withdrawn from the struggle, he advised his master, the emperor, to do the same. This

counsel being taken, he arranged in 1714 the peace of Rastatt.

Next began one of Eugene's greatest campaigns, the one that made him the idol of the Austrians. In the war against the Turks that opened in 1716, he won a victory at Peterwardein, and a greater one when he captured Belgrade. A period of peace followed, the prince serving as governor for the Netherlands, and then as the emperor's representative in Italy. In 1734 he led the Austrians in the War of the Polish Succession, and on April 21, 1736, he died in Vienna.

The greatest of all the soldiers who have served Austria, Eugene was responsible for the only period in her military history that can be called glorious. He had a passion for war, the genius that knew instinctively when risks could be taken, for several of his victories were won over greatly superior forces. He was interested in art, and left a magnificent collection of pictures. The prince never married. There are Lives by G. B. Malleon, 1888; P. Frischauer, 1934; Sir G. MacMunn, 1934.

**Eugène** LOUIS JEAN JOSEPH (1856–79). A French prince. The only son of Napoleon III and Eugénie, he was born in Paris March 16, 1856, and was usually known as the Prince Imperial. Having undergone a military training at Woolwich, 1872–75, he joined the British expedition to Zululand in 1879. He was killed near Ulundi on June 1.

**Eugenics** (Gr. *eugenēs*, well born). The study of agencies under social control that may improve or impair the racial qualities of future generations. That is the original definition of eugenics by the coiner of the word and the founder of the study, Sir Francis Galton (*q.v.*), cousin of Charles Darwin. Before his death in 1911, Galton founded the Galton and Eugenics laboratories at University College, London, and the Eugenics Education (later the Eugenics) society. The two former were essentially research organizations for the study of human heredity and breeding, while the primary object of the latter was the general diffusion of the knowledge gained. The society, however, also plays a considerable part in initiating and financing pure research. These three parent bodies now have equivalent organizations in most parts of the civilized world, and eugenics has become, like its parent science biology, a subject of international interest.

Eugenics has one fundamental premise, which aroused widespread hostility when it was first enunciated during the 19th cent., since it was a development of the then revolutionary theory of evolution, which contradicted the biblical creed of the special creation of man. It is that human beings inherit qualities just as do other animals. A country, therefore, which is concerned with the quality of its citizens, should have regard to their nature as well as their nurture, *e.g.* to their native health and intelligence as well as to their feeding and teaching at school. A subsidiary biological premise lends urgency to the eugenic attitude. That is, that natural selection—the survival of the fittest, in the widest sense of the term—is today profoundly modified by social agencies. Whereas among wild animals or mankind in primitive states the healthiest and most intelligent, broadly speaking, live to be the parents of the next generation, a civilized human community tends (a) to preserve, and permit to breed, mentally and physically defective individuals who would not in a primitive culture survive childhood; and (b) to put a premium through economic conditions on celibacy and childlessness among the most vigorous and successful in the community.

#### Heredity and Vital Statistics

The study or science of eugenics—as distinct from its practical application—is therefore simply a branch of biology, and one that falls naturally into two parts—the study of human heredity, and the study of birth rates, death rates, marriage rates, and similar relevant population statistics. Population and eugenics, indeed, are simply the quantitative and qualitative aspects of the same thing.

Human heredity, likewise, is very largely studied by statistical methods. The biometrical (life measurement) approach initiated by Galton himself is essentially statistical, and so are the methods of analysis of that science of genetics (study of heredity) which developed during the last half-century from the original studies of the Abbé Mendel (*see* Mendelism).

Owing to the popular prejudice against regarding man as an animal, much of the earlier eugenic literature was devoted to proving that human heredity conformed to the ordinary laws of genetics and general biology. That case can now be considered proved. More is known today, indeed, about the heredity of man than about that of



Prince Eugene,  
Austrian soldier  
From a contemp  
porary portrait

any other animal, barring a few small, fast-breeding species studied in laboratories. For the past quarter of a century, therefore, emphasis has been directed more to the intensive study of the inheritance of special human characters, normal and subnormal, and to the eugenic aspects of population trends, *e.g.* to finding out the birth and survival rates of the "social problem group" (*q.v.*) in relation to those of the general population. The objects of the practical eugenic measures that are advocated are both negative—to check racial deterioration—and positive, to raise the racial standard. Sterilization of the certifiably unfit—chiefly the insane and mentally defective—is one negative measure proposed. Closely associated with it is the finding and teaching of methods of birth control simple enough to be used effectively by the simple-minded. A third recommended measure is to call a halt to the provision of indiscriminate state assistance which, eugenicists claim, puts a premium on irresponsible parenthood.

The positive objective of increasing reproduction among the ablest and fittest can, eugenicists believe, be achieved by such economic and social measures as would foster among them early marriage and families with a minimum of three children. They advocate especially granting selective family allowances for professional men on a scale that would prevent the rearing of a family from depressing the family man's economic status below that of his celibate or childless fellow professional. Eugenicists consider education, especially in bringing up the young to think eugenically in choosing a mate and producing children, of great importance in the development of both positive and negative eugenics.

#### Limited Range of Study

The weakness of the eugenic case is that as the life-span of the investigator into human heredity is no longer than that of his subject, his study is limited to at most three generations. Conclusions which one investigator from this limited range of observation may consider established might well be nullified by wider observation. The negative objective of preventing reproduction by subnormal human beings appears to be more soundly based than that of the positive objective: the assumption that the gifted and successful will necessarily produce better offspring than the normal is by no means established. See

Biology; Genetics; Heredity; Mendelism; *also* Birth Control; Birth Rate; Death Rate; Population; Vital Statistics.

Eldon Moore

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**Eugénie** (1826–1920). Empress of the French. Daughter of the Spanish count de Montijo, she



Eugénie, Empress of the French

was born at Granada, May 5, 1826. She went to France in 1851 and married Napoleon III on Jan. 30, 1853. Under her influence the French court became a centre of luxury and extravagance. She was partially responsible for the disastrous French expedition to Mexico in 1863–66 in favour of the Emperor Maximilian, and encouraged Napoleon to embark upon the war with Prussia in 1870. After the French defeat at Sedan, she fled to England, where she was joined by the emperor, and they settled at Chislehurst. Napoleon died in 1873, and her only son, Eugène the Prince Imperial, was killed in 1879 while serving with the British army in the Zulu campaign. The ex-empress moved to Farnborough, Hants, in 1887. She died July 11, 1920, while on a visit to Spain. Together with Napoleon III and her son, she is buried in the mausoleum at Farnborough. *Consult* Memoirs, Comte Fleury, 1920; Lives, M. Paléologue, Eng. trans. H. Miles, 1928; R. Sencourt, 1931; O. Aubry, 1939.

**Eugenius.** Name of four popes, of whom two are notable. Eugenius III, pope 1145–53, was born Bernardo Paganelli at Pisa, where he was educated and ordained. He joined the Cistercian Order, came under the influence of Bernard of Clairvaux, and was made abbot of the monastery of Tre Fontane at Rome. His elevation to the papacy coincided with a revolt against the temporal supremacy, and he was driven to Viterbo. The activities of Arnold

of Brescia (*q.v.*) compelled him to leave Italy, 1146. In France he promoted the second crusade, and promulgated measures for the reform of the clergy. It was not until shortly before his death, July 8, 1153, that, thanks to the intervention of the emperor, Frederick Barbarossa, he was able to return to Rome.

Eugenius IV, pope 1431–47, was a Venetian named Gabriel Condolmieri and a monk of the Celestine order. He was bishop of Siena before being chosen pope. He was engaged in a struggle with the Colonna family, and then with the council of Basel, which refused to dissolve on his order in 1431, the recalcitrants of the council declaring him suspended and deposed, and electing the anti-pope Amadeus of Savoy (Felix V). Outside a comparatively small party, however, Eugenius maintained his position as rightful pope. During 1433–43 he was driven to live at Florence by a revolt of the Romans. He effected a temporary union with the Greek and Armenian churches, 1439. He died Feb. 23, 1447.

**Eugenol.** Chief constituent of clove oil (80 to 90 p.c.). Obtained by distilling cloves, and from pimento-leaf oil, it has the same spicy odour as clove oil, from which it is separated by caustic potash. Eugenol is used medicinally as a carminative, and frequently as a palliative in toothache, a pledget of cotton-wool wetted with eugenol being inserted into the hollow tooth. Commercially eugenol is of importance in the manufacture of vanillin.

**Eugubine Tables.** Seven large bronze tablets found in 1444 in a vault near Gubbio (ancient Iguvium, medieval Eugubium), in central Italy. They are covered with inscriptions in Umbrian and Latin, one in both languages, in excellent preservation. The oldest date from 200 B.C. They embody almost all that is known of the Umbrian dialect and throw valuable light upon the religious customs of ancient Italy. The text contains the proceedings of a priestly corporation named the Attidian brothers, a code of religious ceremonies with directions for auguries, sacrifices, and expiatory ceremonies. *See* Inscriptions.

**EuheMERUS** (4th century B.C.). Greek rationalist. A native of Sicily, and a follower of the Cyrenaic school, he lived at the court of Cassander, king of Macedonia. EuheMERUS was the author of a Sacred Register, in which he tells

how, having been sent by Cassandra to the Indian Ocean, he landed in the mythical island of Panchaea. Here he discovered, inscribed on a golden pillar in a temple of Zeus, a history of the world, the study of which led him to the conclusion that the gods and heroes were nothing but supermen, on whom divine honours had been bestowed after death. These ideas survive in the modern term Euhemerism. His writings were translated into Latin by Ennius, and fathers of the church made use of them as arguments against paganism.

**Eulenspiegel**, *TILL*. Name of a peasant to whom were ascribed the jests and practical jokes in a popular Low-German collection of the late 15th century (now lost). The High-German version, the basis of all subsequent editions, was printed in 1515. Eulenspiegel is supposed to have been an actual person, who died in 1350, and his traditional grave is shown at Mölln. His story was widely popular in Europe and in England, and is the theme of an epic novel by the Flemish writer, de Coster (1868), and the basis of a symphonic poem by Richard Strauss (1895). See Tyll Owlglass.

**Euler**, *LEONARD* (1707-83). Swiss mathematician. Born at Basel, April 15, 1707, he became professor of mathematics at St. Petersburg, 1733, and at Berlin by Frederick II's invitation, 1741, returning to Russia in 1766. He died there Sept. 18, 1783. He was an accomplished mathematician and prolific writer, doing valuable work in mathematical analysis in revising and coordinating the existing branches of pure mathematics, and in a study of planetary motions. His name was given to the Eulerian numbers, coefficients of expansion.

**Euler-Chelpin**, *HANS KARL AUGUST SIMON VON* (b. 1873). German-Swedish chemist. Born at Augsburg, Feb. 15, 1873, he studied chemistry at Munich, Berlin, and Paris, and in 1898 became a lecturer at Stockholm university. After his marriage to the daughter of a Swedish nobleman he was naturalised Swedish, and during 1906-41 held the chair in chemistry at Stockholm. He specialised in chemistry of plants, especially of moulds, and was director of the biochemical institute and institute for research in organic chemistry. His researches and publications on fermentation were important for the food and pharmaceutical industries, and he was awarded the Nobel prize for chemistry in 1929.

**Eumaeus** (Gr. *Eumaios*). In Greek legend, the faithful swineherd of Odysseus, to whom his master revealed himself when he arrived in disguise in his native Ithaca after 20 years' absence. Eumaeus afterwards helped Odysseus to slay the suitors of Penelope (*q.v.*). *Pron.* U-mē-us.

**Eumenes** of *CARDIA* (c. 360-316 B.C.). Private secretary to Philip of Macedon and Alexander the Great. He accompanied the latter on his Persian campaigns, and on Alexander's death, in 323 B.C., became ruler of Paphlagonia, Cappadocia, and Pontus. After a four years' struggle with Antigonus (*q.v.*), he was taken prisoner by the latter and put to death. See Craterus. *Pron.* U-men-eez.

**Eumenes**. Name of two kings of Pergamum. Eumenes I reigned 263-241 B.C., but Eumenes II, who reigned 197-159 B.C., is the more important. Realizing that his interests lay in recognition of the power of the Romans, he entered into an alliance with them, assisted them in the war against Antiochus the Great, taking part in the battle of Magnesia, and was established by them as ruler of Mysia, Lydia, Phrygia, Lycaonia, and Pamphylia. His lukewarmness in the war against Perseus, king of Macedonia, caused him to be suspected of intriguing with the enemy, and he never completely regained Roman favour. Under his rule Pergamum became a city of great magnificence. Eumenes founded a library said to rival that of Alexandria. See Pergamum.

**Eumenides** or *ERINYES*. In Greek mythology, avenging deities who pursued those guilty of crime, especially crimes against the family and crimes of bloodshed. They are represented as winged women with snakes sprouting from their heads instead of hair, and bearing torches and scourges. They were three in number—Tisiphone (avenger), Alecto (unceasing, relentless), and Megaera (jealous). Erinyes was the older name, Eumenides (the kindly) being a euphemistic title, bestowed upon them after they had abandoned their persecution of Orestes. In Attica they were by preference called Semnai, the awful goddesses. They were propitiated by wineless libations of water, milk, and honey. Furiae and Dirae were the Roman equivalents. *Pron.* U-meni-deez.

**Eumenides**. Tragedy by Aeschylus, last of the trilogy Oresteia. The subject is the trial of Orestes before the Areopagus (*q.v.*) for the murder of his mother, Clytemnestra.

The Erinyes act as prosecutors, and Orestes, who is defended by Apollo, is acquitted by the casting vote of Athena. The play ends with a panegyric of Athens and its venerable court of justice, and the Erinyes are propitiated by their name being changed to Eumenides. See Agamemnon; Choephoroi.

**Eumolpus** (Gr., sweetly singing). In Greek mythology, son of Poseidon, the sea-god, by a mortal mother, Chionē, who, in remorse, threw the infant Eumolpus into the sea. He was saved by Poseidon, and after many adventures reached Attica, where he perished in a war with Erechtheus, the Athenian king. He was credited with being the founder of the Eleusinian mysteries, and his descendants, the Eumolpidae, were priests at Eleusis throughout the history of ancient Greece.

**Eunuch** (Gr. *eunē*, bed, *ekhein*, to keep). Word originally applied to a man in charge of the women's apartments in Oriental countries, but afterwards to a castrated attendant in the harem. The custom of entrusting women to eunuchs has prevailed in the East since Babylonian times, and was imitated by the later Roman emperors. These eunuchs frequently acquired great power and high position. In modern times lads were castrated in order to preserve their clear boyish voices. Italian churches employed *castrati* in choirs, but Leo XIII abolished the practice in 1878. From time to time religious fanatics have undergone self-mutilation, the Skoptsi, of Russia, being notable examples. The only Christian self-castrate of note was Origen.

**Euonymin**. Extract of the bark of *Euonymus atropurpureus*, the spindle-tree of the U.S.A. It is useful for constipation associated with disturbance of the liver. See Spindle Tree.

**Eupatoria** or *YEVPATORIA*. A seaport and industrial town of Russia. It stands on the W. coast of the Crimea at the N. end of Kalamita Bay, 40 m. N.W. of Simferopol. Its Tartar name was Gyuzleve, Russian Kozlov. In 1783 it was taken from the Tartars by the Russians, who renamed it Eupatoria, after the ancient town founded by Mithradates VI the Great, King of Pontus. In 1855-56 Eupatoria was occupied by Anglo-French troops. Bombed by the Germans during the assault on the Crimea, Eupatoria was evacuated by the Russians in Oct., 1941, and in Jan., 1942, was vainly attacked by them. It was recaptured from

the Germans by units of the 4th Ukrainian army on April 13, 1944. The industries concern machinery and chemicals. The town contained a Karaite Jewish synagogue, a mosque on the plan of S. Sophia, Istanbul, and a Greek Catholic cathedral. Pop. approx. 23,000. See Crimean War.

**Eupatridae** (Gr. *eu*, well; *patēr*, father). Nobility of Athens and Attica, supposed to be descended from the ancient heroes. The rest of the inhabitants were roughly divided into Geomori or farmers, and Demiurgi or artisans and traders. As the kingship declined, the influence of the Eupatridae increased until they virtually governed the state. Their influence was checked by Draco's code of laws, providing for the administration of justice equally among all classes, and ended by the constitution of Solon. See Draco; Solon.

**Eupen.** District and town of Belgium. The territory known as the Kreis (circle) of Eupen lies S. of Aix-la-Chapelle (Aachen), and covers an area of 400 sq. m., with a pop. of about 60,000. It is fertile, with rich pastures and meadows, and its chief industry is dairy farming. It contains Eupen, Raeren, Kammerdorf, and Conzen. The town, the administrative centre of the Kreis, has a pop. of about 13,500. It is on the Weser, 10 m. S. of Aix-la-Chapelle, and makes woollen goods, paper, soap, and machinery. It has iron-foundries, breweries, and tanneries.

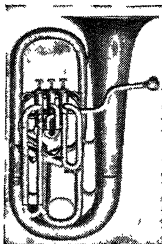
Formerly part of the duchy of Limburg, Eupen was under the government of Austria until 1801, when by the peace of Lunéville it passed to France. In 1814 it was given to Prussia, later forming part of the Rhine province until 1919. The town reverted to the old French name of Néaues (*q.v.*). By the treaty of Versailles, Germany renounced in favour of Belgium all rights and title over the territory comprising the whole of the circles of Eupen and Malmédy. Belgian troops occupied Eupen on May 26, 1919, taking it over from the French. The Germans occupied Eupen on May 10, 1940, the day they invaded the Low Countries; and the town was reincorporated in the Reich on May 18. It was captured by U.S. armoured units on Sept. 11, 1944. *Pron.* Oy-pen.

**Euphausiacea.** Order of crustacea (*q.v.*) containing only a few genera. Together with the dactyopoda (the large order containing lobsters, crabs, etc.) they make up the group called the eucarida in which the carapace fuses with all the

thoracic segments, forming the familiar solid covering of *e.g.* the crab. Most euphausiaceans are about the size of large prawns. They form the food of the great whales which in their turn provide man with huge supplies of oil and fats. They are plentiful in the S. Polar seas, and much work has been done on their ecology in relation to the whale fisheries, for instance by the Discovery expeditions.

**Euphemism** (Gr. *eu*, well; *phēmē*, voice). Substitution of refined and delicate words for coarse and vulgar words conveying the same idea. The object is to disguise as far as possible painful or unpleasant subjects which yet must be referred to. In English literature the device was widely over-used in the Victorian era, when gentility required that the term "unmentionables" should replace "trousers," "nether limbs" disguise "legs," etc. Later writers have tended to abandon this practice. By extension, the term is applied to an expression such as "passed away" for "died," which is intended to mitigate the austerity of a simple statement.

**Euphonium** (Gr. *eu*, well; *phōnē*, sound). Brass wind instrument of the saxhorn family. Of

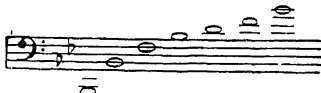


Euphonium,  
4-valve instrument  
By courtesy of  
Hawkes & Co.

bass pitch and tone, it is of the same pitch as the baritone saxhorn, but its bore is wider and tone fuller. The euphonium is the chief bass solo instrument in military bands, and often doubles the melody an octave below the cornets. It also plays bass parts with the heavier bass instruments, bombardon, bass tuba, etc. Euphoniums are made in C and B flat, both played as non-transposers. In brass bands the B flat euphonium is sometimes written for on the treble stave, when it becomes a transposer, and the notes are placed a major ninth higher, *i.e.*



The open notes of the B flat instrument are:



and its three, four, or five pistons complete the scale, and give a chromatic compass of over three octaves.

**Euphorbiaceae.** Large family comprising trees, shrubs, and herbs. They mostly possess milky juice



Euphorbiaceae. Two species: left, sea spurge; right, dwarf spurge

and grow in all parts of the world except the Arctic zones. The leaves are all undivided, and either alternate or opposite. The sexes are always in separate flowers without petals. About 3,500 species are known, including spurges, mercury cassava, castor-oil plant, croton hevea (producing rubber), etc. Preparations of *Euphorbia pepus* and *E. pitulifera* are sometimes used in medicine, to relieve conditions associated with difficult breathing. The order is named after a Greek physician, Euphorbus (1st century B.C.). The box and a few allied genera formerly included in the Euphorbiaceae, now form a distinct family, the Buxaceae.

**Euphorbus.** In Greek mythology, a Trojan hero slain by Menelaus. Pythagoras, who taught the transmigration of souls, believed that he himself had once been Euphorbus, and in proof he unhesitatingly identified the shield of Euphorbus in the temple of Hera near Mycenae as his own.

**Euphrates.** The western river of Iraq, flowing over the alluvial plain to join the Tigris and enter the Persian Gulf. One of the notable rivers of antiquity, the joint valley was the home of the earliest civilization. The river, called Frāt by the Turks, rises in N.E. Turkey, about lat. 40° N. The parent streams, the Kara Su and the Murad Su, originate well over 1 m. above sea level. Both flow at first west between snow-capped ridges; the Kara Su crosses the plain of Erzerum, and is a big river, 200 ft. in width; it breaks through the southern ridge by a series of rapids, receives the Murad Su at Keban Maden, flows still W. and then breaks through a second ridge by a long, narrow gorge, to enter the Malatya plain at a level of about 2,600 ft. The

Murad Su, which rises near Mt. Ararat, has a wilder course than that of the Kara Su, and receives greater quantities of melted snow.

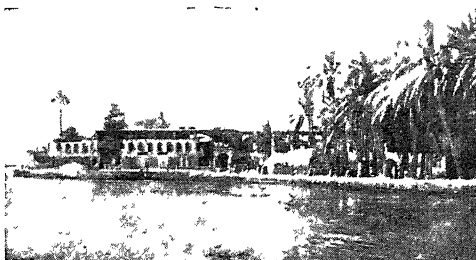
From the plain the Euphrates has a rocky course through the Tauric mts. to Samsat, falling 1,500 ft. in about 100 m., to emerge on to the lowland and fall 1,000 ft. in 1,800 m., a broad, majestic stream crossed until quite recently only by primitive ferries. In the neighbourhood of Aleppo, Syria, the river is but 80 m. from the N.E. corner of the Mediterranean Sea, but almost immediately turns definitely S.E. on its way to the Persian Gulf. The lowland course is in a sandy trough, comparable to that of the Nile in Egypt; a narrow bordering strip is cultivable by the use of river water; it receives only one important tributary, the Khabur, and consequently decreases in volume by excessive evaporation.

During hot summers it becomes fordable; nearer Kurna, where it joins the Tigris, it percolates into marshes, losing still more water. The combined stream is the Shatt-el-Arab. The Euphrates has no large modern town on its banks, but ancient Babylon was beside the river. The stream is navigable for small craft to Birejik on the caravan route to Syria. Its total length is about 1,700 m.

**Euphuism** (Gr. *euphuês*, clever).

Name given to the artificial style in which John Lyly (*q.v.*) couched his famous romance *Euphuës*, the *Anatomy of Wit*, 1579, followed in 1580 by *Euphuës and His England*. The characteristics of this "new English" were the balanced antithetical sentences marked by elaborate alliteration, the excess of classical allusion, and the extravagant drafts upon natural history for purposes of moral reflection. The high artificiality of euphuism carried the seeds of decay within it, and it died before the 16th century was out. Scott claimed to have modelled Sir Piercie Shafton in *The Monastery* on the euphuistic fashion which prevailed for some years.

**Eupolis** (d. c. 410 B.C.). Athenian comic writer. He was a con-



Euphrates. Tomb of Ezra near Kurna, at the junction of the Euphrates and the Tigris

temporary of Aristophanes and Cratinus, with whom he was associated by Horace and others as one of the chief representatives of the old comedy. Among his comedies, of 12 of which fragments remain, were *Kolakes* (the Flatterers), ridiculing the wealthy Callias, a patron of learning; *Marikas*, an attack on the demagogue Hyperbolus (*q.v.*), represented as a slave; *Dëmoi*, lamenting the unhappy condition of the state under the encroachments of democracy; and *Baptae* (the Dippers), an exposure of the licentious practices of Alcibiades.

**Eurasian**. Term originally denoting the offspring, and their descendants, of a European father and a Hindu mother. It was formed out of the continental names, about 1820. The term now denotes any mingling of European and Asiatic blood; and, in physiology and ethnology, natural or ethnic characters common to both continents.

**Eure**. River of France. It rises in the dept. of Orne and flows through the depts. of Eure-et-

wheat is grown. Horses, sheep, and cattle are reared, a great deal of fruit is cultivated, and the peasants export butter and eggs. The Seine borders the dept., which is also drained by the Eure, Rille, and other tributaries of that river. Evreux, the capital, Elbeuf, Les Andelys Bernay, Verneuil, and Louviers are the chief towns. Before the Revolution, Eure was mainly part of Normandy. Its area is 2,330 sq. m. Pop. 315,902.

**Eure-et-Loir**. Department of France. An inland dept. in the N.W. of the country, it is flat and fertile in the S. and E., but less so in the N. and W. The former is included in the plain of Beauce, while the latter is known as the Perche and the Thimerais. The chief rivers are the Eure, Loir, and their tributaries. The most important products are wheat and oats. Apples are grown, while cattle, sheep, and horses are reared. Chartres is the capital, and Dreux and Châteaudun are other towns. Before the Revolution the dept. was partly in Normandy and partly in Orléanais. Its area is 2,291 sq. m. Pop. 258,110.

**Eureka** (Gr. *heureka*, I have found). Exclamation of Archimedes (*q.v.*), when he ran naked from his bath through the streets of Syracuse after discovering a method of detecting the alloy in the gold of Hiero's crown.

**Eureka**. City of California, U.S.A., the co. seat of Humboldt co. It stands on Humboldt Bay, 284 m. N.W. of San Francisco, and is served by rly. and airport. A port of entry, it is largely engaged in shipping lumber, obtained from the redwood forest region in which it is situated. It has fisheries and also ships dairy and poultry produce. Settled in 1850, it was incorporated in 1856. Pop. 17,055.

**Eurhythmics** (Gr. *eu*, well; *rhythmos*, measured motion). Art of expressing harmony by gestures



Loir and Eure to the Seine, which it enters near Pont de l'Arche, not far above Rouen. Its length is about 70 m. and Chartres is the chief place on its banks.

**Eure**. Department of France. In the N.W. of the country, it is a fairly level area, and the soil is fertile. Much of it is covered with forest but elsewhere



Eurhythmics. Two attitudes in a plastic exercise in this rhythmic method of physical training



in which physical movement is made to reflect musical notation. It was invented by Émile Jaques-Dalcroze (*q.v.*), professor of harmony at Geneva Conservatoire, towards the end of the 19th century. Time is shown by movements of the arms and notes by movements of the legs. The unit is the crotchet, which is indicated by a single step, longer or shorter notes being shown by a step with one foot and movements with the other. The various exercises relate to rates and changes of speed, dynamic expression, syncopation, phrasing, etc., and are made by both arms and legs.

**Euripides** (480–406 B.C.). Athenian tragic dramatist. According to tradition, he was born on the island of Salamis on the day of the great naval victory over the Persians. A pupil of the sophist Prodicus, he seems to have been at first intended for a professional athlete, and secondly, for a painter, but soon took to writing for the stage. In 455 B.C. he exhibited his first tragedy, and in 441 gained the first prize for the first time. The last few years of his life were spent at the court of King Archelaus in Macedonia, where he died.



Euripides,  
Greek dramatist

Euripides was credited with over 90 plays in all, of which 18 survive. He gained the first prize only five times, his contemporaries apparently regarding him as inferior to both Aeschylus and Sophocles and other dramatists. His vogue increased, however, after his death, and though never the favourite of the critics, he has been the favourite dramatist of many of the world's poets, notably Virgil, Horace, and Milton. Euripides is undoubtedly a master in the handling of the tender and the pathetic. Aristotle truly called him "the most tragic" of the poets. A reputed misogynist he has yet portrayed women as fine as any to be found in all literature. As a playwright also Euripides stands high; there is an excitement about his plots and a vividness in his situations, although they sometimes verge on the ridiculous, which are lacking in the plays of Aeschylus and Sophocles. Euripides is, in fact, the most human of the three dramatists, and this quality of humanity accounts for his greater popularity

in subsequent ages. Among the blemishes of his art may be mentioned his artificial prologues and his too frequent use of the *deus ex machina* (*q.v.*) or divine intervention in unravelling a plot.

The extant plays of Euripides are: *Alcestis*, *Medea*, *Hippolytus*, *Hecuba*, *Andromache*, *Ion*, *The Suppliants*, *Heracleidae*, *The Mad Heracles*, *Iphigenia among the Tauri*, *The Trojan Women*, *Helen*, *The Phoenician Maidens*, *Electra*, *Orestes*, *Iphigenia at Aulis*, *Bacchae*, *Cyclops*, the last being the only extant specimen of a satyric drama. The *Rhesus* is certainly spurious. Of the plays perhaps the best are *Alcestis*, notable for its exquisite delineation of woman's devotion; *Hippolytus*, the tragic story of the illicit love of *Phaedra*, a plot used by Racine in his

between the island of Euboea and the mainland of Greece. See *Chalcis*.

**Euroclydon** (Gr. *Euros*, east wind; *klydōn*, wave). Name given in Acts 27, v. 14, to the gale which, blowing off Crete, seized the ship in which S. Paul was wrecked on the coast of Malta. The form adopted in the R.V. is *Euraquilo*, meaning a tempestuous N.E. or E.N.E. wind of the Mediterranean.

**Europa**. In Greek mythology, daughter of Agenor, king of Phoenicia. While she was playing one day with her maidens, Zeus appeared in the form of a white bull, and Europa was induced to mount on the animal's back. The bull thereupon carried her off over the sea to Crete, where by Zeus she became the mother of Minos, Rhadamanthus, and Sarpedon.

She was worshipped under the name of *Hellotis* in Crete.

**Europa**. German liner. Built at Hamburg by Blohm and Voss, for Norddeutscher Lloyd, the *Europa* was a sister ship of the *Bremen* (*q.v.*) and was launched in 1928, but damaged by fire and not completed until 1930. She displaced 51,650 tons on a length



Europa. The story of Europa depicted by Paolo Veronese  
*Doge's Palace, Venice*

*Phèdre*; and *Bacchae*, a brilliant glorification of the worship of Dionysus or Bacchus. The plots of Euripides were all drawn from the old mythology, yet the characters are not cast in heroic mould, but act and talk like Athenian men and women of his time. Euripides was accused by his contemporaries of endeavouring to undermine faith in the gods and in morality, and for this supposed tendency, as well as for his alleged bad art, he was bitterly attacked by Aristophanes. See *Greek Literature*. *Prom. U-rippi-deez*.

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**Euripus** (Gr. *euripos*). General name for a narrow channel, specially applied to the strait

of 940 ft. and a beam of 101 ft.; eight triple sets of turbines allowed a speed of 26.5 knots. On her maiden voyage to New York she set up a new record by crossing from Cherbourg to Ambrose Light in 4 days 17 hours 6 mins.; in 1932 she bettered her own record by 3 hrs. 15 mins. In 1935 this time was beaten by the French liner *Normandie*. Throughout the Second Great War the *Europa* was laid up at Bremerhaven; in 1945 she was taken over by the U.S. government for conversion into a troopship; and in 1946 taken over by the Compagnie Générale Atlantique and renamed *Liberté*. On Dec. 8 that year she sank in Havre harbour, but was raised in April, 1947.

**Europa Point.** Headland at the extremity of the peninsula of Gibraltar, Spain, just S.E. of Europa Bay. To the N.W. is Little Europa Point and to the E. Great Europa Point. Europa Bay is a small circular inlet in the S.W. coast of the peninsula just S. of Shingle Point.





# EUROPE: ITS GEOGRAPHY, CULTURE, HISTORY

E. STERN-RUBART, A. D. INNES and G. P. GOOCH, D.Litt

*Europe, in many respects of climate and other natural features the most favoured of the land masses of the earth, for a number of centuries dominated the world, both militarily and economically. Its rise, its long period of power, and its disruption by wars are here described. For the story of Europe after 1945, see N.V.*

Europe, smallest but one of the earth's continents, takes its originally Greek name from the Semitic word *ereb*, dark; it is the Occident, as compared with the Orient of Asia. In fact it is a huge peninsula of the greatest continent, Asia, with which it forms Eurasia—a term meaning the Old World in comparison with the New, *i.e.* American, hemisphere. The borders between Europe and Asia are conventional ones determined neither by a clear-cut difference in physical conditions, nor by a racial or linguistic distinction. Europe covers just over 4 million sq. m., with about 500 million inhabitants.

Its outstanding physical characteristic is the deep inroad made by the sea into its surface. This produces a coastline with a length of 23,250 m., slightly longer than that of Africa. This coastline embraces a dozen peninsulas, of which the most extensive are Scandinavia, Finland, Kola, in the N., and the Iberian, Balkan, and Italian peninsulas in the S.

## Influence of Sea on Climate

These inroads of the sea into the land also affect the climate of Europe, which is dominated virtually all over the continent by oceanic air currents and temperatures; and while Europe's greatest distance W. to E. is 3,150 m., and N. to S. nearly 2,500 m., the furthest inland city (Sverdlovsk in the Urals) is only 800 m. from the sea, and excluding Russia, only a fraction of that distance. The coast is surrounded by islands which link it, in the S.E. with Asia by the Greek archipelago, in the S. with Africa by Sicily, in the N.W. with America by the British Isles. The narrow strip of the Bosphorus, and the 10½ m. strait of Gibraltar separate it from Asia and Africa respectively. The 100-fathom line runs from the Spanish coast to the Bay of Biscay and from there sweeps around the British Isles to the S. of Norway, whose rugged coast drops deep into the sea; including the comparatively flat and shallow North and Baltic Seas, the continent of Europe, together with its submerged parts, is therefore considered as stretching to beyond the W. of Ireland.

Physically, Europe is the continent with the lowest average altitude—1,000 ft., against *e.g.* 3,200 ft. over Asia; plains, up to 650 ft., cover 60 p.c. of its surface; its highest mountain range, the Alps, reaches 14,600 ft., the Carpathians 8,100 ft., the Gran Sasso in Italy nearly 8,900 ft., the Mulahacen in the Sierra Nevada 10,600 ft., and the Pic d'Aneto in the Pyrenees just under 10,400 ft. A great variety of other mountains have peaks of 4,000–7,000 ft.; as watersheds, they account for the fluvial system.

## Rivers and Canals

Its greatest rivers flow across the plains of the E., the principal one being the Volga with a length of 2,500 m., followed by Dnieper, Don, and Dvina. Europe's second longest river, the Danube with 1,780 m., has wound its way through mountain ranges. With the Rhône, the Po, and the Rhine, it belongs to the Alpine watershed, though the mouths of these rivers are far apart. The Vistula, Oder, and Elbe, three great central European rivers, have likewise the area of their sources in common, between the Tatra and the Sudeten Mts.; the same applies to most Spanish rivers. As most of the navigable rivers from the French Atlantic coast to the Gulf of Finland cross the plains in a slow and steady flow, they have been linked by a network of canals which, in France, connects Atlantic with Mediterranean; in Germany, North Sea with Baltic, North Sea with (via Danube) Black Sea; in Russia, Caspian with Arctic and Baltic, Baltic with Black Sea.

**GEOLOGY.** The oldest parts of the continent are in the N. and extreme W., from Ireland to Finland, consisting mainly of igneous Archaean rock. The huge E. plain which covers European Russia, Poland, Denmark, N. Germany, and the Low Countries is the result of erosion from the mountains in the S., and glaciation in the N., during the Diluvial period. All folds S. of the belt of Archaean rocks are considered as consequences of a process which started during the Mesozoic, and reached its climax during the Tertiary period. Folded mountains arose, either by tectonic pressure,

or by the eruption of huge masses of magma; the latter in particular accounts for the mountains of W. Scotland, the French central massif, the Eifel W. of the Rhine, and the Bohemian mountain chains. Farther south however, frequent earthquakes and volcanic eruptions produced folds of great length, by lateral pressure (this process has not entirely died down, as indicated by continuing volcanic activity—Vesuvius, Etna, Lipari Islands) and, by counteraction, created simultaneously deep grooves and plains, such as the Hungarian Alföld and the plains of the river Po. The latest tectonic transformation took place during the Diluvium, when the Baltic and North Seas came into being by slow subsidence of their soil, and Asia and Africa were separated from Europe. During that period all N. Europe inclusive of the British Isles was covered with ice, while the approaches of the high mountains were penetrated by glaciers such as still remain in the Alps. In the neighbouring plains the diluvial deposits—moraines, sand, etc.—mostly determine the character of the soil, and to some extent the climate.

## Rich Variety of Minerals

This great variety of geological transformation to which Europe was subjected accounts for its comparative wealth in minerals. It yields iron ore in Sweden, Britain, France, Germany, Austria, and Russia; zinc in Britain, Italy, and Germany; tin in Britain and on the Czech-German border; lead in Britain, Spain, Czechoslovakia, and Germany; copper in Britain, Sweden, Russia, and Germany; platinum, gold, and silver in the Urals, the last two also in the Carpathians; mercury in Spain and Carinthia. Coal is widely distributed, but particularly in Britain, Belgium, Germany, and S. Russia. Petroleum is found in Rumania, Poland, Russia, and to a smaller extent in Austria, Hungary, Hanover, and Alsace. Bauxite comes mainly from France, Hungary, and Switzerland. Many rare radio-active elements have considerable deposits on European soil.

The tectonic origin of Europe's surface produced a number of

lakes, most of which, however, were the results of the diluvial floods. The largest are Ladoga with 7,100 sq. m.; Onega, 3,600; Wener, in Sweden, 2,200; Wetter, likewise in Sweden, 730; Balaton, in Hungary, 250; Geneva, 225; Constance, 205 sq. m. Other remnants of the great flood still exist as swamps in Russia, along the Pripet river and near the Caspian, but most are subjected to systematic drainage.

**CLIMATE.** Except for its arctic N., Europe belongs to the moderate zone of climate; but it enjoys a milder temperature than would normally exist at its latitude. The Gulf Stream affects its W. and N. coasts, and W. winds prevail. Also the E.-W. direction of all important mountain ranges does not put obstacles in the way of the warm streams of oceanic air, which penetrate deep into the E. As a result the Norwegian coast is 35° F. and the Baltic is 22° F. warmer in the winter than the world average for corresponding latitudes. The same applies to the N. of Scotland—35° F. above the average in Jan.—and, with a decreasing curve, to all parts near the W. and N.W. shores. The 32° F. isotherm, which limits the area frostbound during the winter, runs from the North Cape through Hamburg, the Alps, the Balkans, the Crimea, to S. of the Caucasus, which separates Europe from Asia. In summer, temperatures are normal for the latitude.

The rainfall exceeds 60 ins. annually on the highest areas and on parts of the W. coast. The Pyrenees, Alps, Balkans, and Caucasus include districts where the rains exceed 40 ins., but most of Europe has an annual precipitation of between 20 and 40 ins. Spain and E. and N. Russia receive less than 20 ins. The Mediterranean peninsulas are lands of clear skies with a maximum duration of sunshine in excess of 2,500 hours annually. Scandinavia is a cloudy area with less than half as much sunshine.

**VEGETATION.** European flora is largely the result of its geological development. During the Tertiary period the soil was covered by tropical and subtropical vegetation; in the Diluvial period it was covered by arctic plants still found in the higher mountain ranges; and when the ice vanished, other plants, mainly from the E., immigrated with the increasing warmth and humidity. There are now four clearly distinguished

zones of vegetation: the Arctic, with treeless tundra carrying moss, lichen, and rampant shrubs; the Central European pine and leafy woods, with summer-green meadows; the Mediterranean belt, with evergreen plants and tropical palms; and the S. Russian grass steppe, branching off into Hungary.

Economic plants are the olive tree, in Greece, Italy, and Spain; vine up to about 50° N.; wheat to about 60° N. (in specially vernalized varieties, much farther N.); rye to nearly 70°; maize in Rumania, Hungary, Italy, and N. Spain; oranges, figs, and other fruits, mainly along the Mediterranean and in Portugal. Trees range from plane, chestnut, and cork-oak in the S. to beech, oak, and lime in the central zone, birch and pine in the N.

Dairy farming and cattle breeding are spread over nearly the whole continent. The fauna of Europe, except for birds and small animals, is not so much the result of climate and geology as of man's influence, which eliminated most of the larger wild animals not qualifying for domestic exploitation.

**POPULATION.** Europe's inhabitants can be placed roughly in three large main linguistic or racial groups: Latin, Germanic, and Slavonic. Embraced by both the former are the small remnants of the Celts; by the latter those of the Balts. Finns and Hungarians, Greeks, Albanians, Turks, Basques, some Jews, and gypsies belong to none of the three main groups which, together, represent 90 p.c. of Europe's population. The number of different languages is about 70, half spoken by at least one million people each, 13 of them within European Russia; the other half together by only 8 millions. See table p. 3179.

#### Religions of Europe

The religious grouping shows more than 96 p.c. Christians, of whom Roman Catholics with 44 p.c. or 220 millions (Eire, France, Spain, Portugal, W. and S. Germany, Italy, Austria, Hungary, Poland) are the strongest numerically. Protestantism, with 28 p.c. or 140 millions, is dominant among the Germanic peoples, Finns, Estonians, Letts, and in parts of Czecho-Slovakia and Hungary. The Orthodox churches count about 25 p.c. or 125 millions among the Eastern Slavs, Greeks, Rumanians, and other Balkan nations. There are about 12 million Mahomedans, and before 1939 there were 9-6 million Jews.

After the Second Great War (treating Germany as one national unit) Europe held within its

#### STATES OF EUROPE, 1947, IN ORDER OF POPULATION

European Russia (U.S.S.R.)  
Germany  
United Kingdom  
France  
Italy  
Poland  
Spain  
Rumania  
Czecho-Slovakia  
Yugoslavia  
Belgium  
Netherlands  
Hungary  
Sweden  
Austria  
Portugal  
Greece  
Bulgaria  
Switzerland  
Denmark  
Finland  
Norway  
Eire  
Turkey in Europe  
Albania  
Luxemburg  
Iceland  
Monaco  
San Marino  
Liechtenstein  
Andorra

boundaries seven large states, with over 20 million inhabitants each; 10 medium ones, with between 5 and 20 millions each; ten small ones, with below 5 millions; and four midget states, with under 100,000 each. In extent of territory, however, Sweden ranks fourth among the great powers (above Germany); Finland and Norway sixth and seventh respectively, above Poland; Iceland 16th, above Hungary; and the Netherlands and Belgium, between Switzerland and Albania.

Virtually none of these European nations has a completely homogeneous population. In Switzerland the largest part speaks a German dialect, two smaller ones French and Italian, and a fraction Romansch. Belgium is split between the French element of the Walloons and the Germanic Flemings. France has Germanic Flemings and Alsatians, Celtic Bretons, and Basques. Great Britain has Germanic, Celtic and older elements. Germany has Nordic, Dinaric, and Alpine races, and Slavonic remnants; Italy, Langobardian and Moorish strains; while Russia, dividing her own people into Great Russian, Ukrainian, and White Russian, contains numerous partly Asiatic populations. In Spain are Iberian and Celtic elements, infiltrations of Germanic Goths, Vandals, and Semitic Moors and the larger part of the remaining aboriginal Basques.

The density of population, indicative likewise of the state of civilization and economic activity and prosperity, varies widely. A belt of the densest population, with over 250 per sq. m., reaches from Lancashire and Yorkshire, through London, the Netherlands, and Belgium, along the Rhine to the Alps, through the centre of Germany (Thuringia, Saxony), S. Poland, deep into the industrial area between Kiev and Stalingrad. An extension runs S. of the Alps from Lombardy through the Italian peninsula to Sicily. Along these belts are situated all the areas of densest population, with more than 500 inhabitants per sq. m.

Apart from the mountainous districts—the Scottish Highlands, Pyrenees, Alps, Carpathians, etc.—and large parts of the Scandinavian peninsula, areas with fewer than 20 inhabitants per sq. m. are found only in N.E. Russia, around the Caspian, in Finland, and on the Spanish plateau (which became sterile in consequence of senseless and radical deforestation in the Middle Ages).

#### How Religion Affected Civilization

European civilization and culture are, to a large extent, linked with religious development. Springing from the Mediterranean (Greece and later Rome), civilization shifted its centre slowly, first to the Romance countries until, in the Middle Ages and later, the Germanic nations came to share it, while the E. Mediterranean and the adjacent Balkans lost their predominance, largely after conquest by the Turks. The E. of Europe, partly because of its Orthodox Church with Byzantine influence, and the influx of Asiatic populations, developed a civilization independent of the general European one. The comparatively high degree of European culture is largely the result of its great variety of conditions. Its numerous geographical sectors have easy access one to another, and this exchange has prevented localised stagnation. The general standard of education is highest in the N. and N.W., lowest in the E. and Spain, though in Soviet Russia the number of illiterates is rapidly dwindling.

**INDUSTRY.** The belt of densest population is identical with Europe's main economic arteries. Agriculture, favoured by the large extent of the plains and the comparatively mild climate, continues to play a primary part in Europe's economic life, while the incomparable coast has made fishing more significant than on any other

continent. Industrial development, based upon the exploitation of large coalfields, took place in the course of little more than the 19th century. Apart from the zones of densest population mentioned, main industrial centres are the heart of Sweden, the Rhône valley, Catalonia and the Basque N. of Spain, and a few big cities, e.g. Paris, Berlin, Hamburg, Warsaw, and Moscow.

#### Gradual Exhaustion of Natural Resources

Between these and other parts of the continent there is an exchange of raw materials and finished goods, although the exploitation of Europe's natural resources, especially ores, has long reduced the available quantities so as to make imports from overseas a necessity. Iron ore, for many European countries, comes mainly from Sweden and Spain, but gold, silver, copper, and mineral oils mainly from outside Europe. The continent's proportion in the world production of coal, iron, zinc, and lead is rapidly dropping, partly because of greater American and Asiatic Russian output. Europe mined 60 p.c. of the world's coal in 1900, but only 45 p.c. in 1929. For steel the corresponding figures are 65 p.c. and 35 p.c.

Industrial development in specific areas is due to historical factors like the transformation of domestic crafts into mass-production. Thus, specialised textile industries are found in Lancashire, N.E. France and Belgium, S. of the Ruhr in Krefeld and Wuppertal, in Saxony, Czecho-Slovakia, Austria, Switzerland, N. Italy, in Lyons (for silk), in Lodz, and around Barcelona. Glassware and ceramics flourish in Britain, Belgium, Thuringia, and Bavaria, Czecho-Slovakia, and along the German-French borders. Electrical and chemical industries, comparatively independent of proximity to heavy raw materials, have developed in or near London, Manchester, Paris, Marseilles, Berlin, Cologne, Frankfurt-on-Main, Mannheim, Halle, Zürich, Milan, Vienna, Prague, Brno; the same applies to motor car, optical, photographic, and other industries. Watches are a speciality of Switzerland; before the Second Great War, toys were a speciality of Nuremberg and Thuringia; clocks of S. Germany; women's fashions originate in Paris, sports equipment in Great Britain, etc.

In order of industrial development the countries can be listed as follows: Great Britain, Belgium, Germany (pre-war), France, Italy,

Switzerland, Czecho-Slovakia, Austria—these last two forming a transition from the agrarian to the industrial state; the Netherlands and Norway, important trading, if not industrial, countries; Spain and Sweden, exporters of raw materials and foodstuffs; Poland, with coal, zinc, and timber, and Rumania, with petroleum, agrarian countries with less developed industries. The Balkan states, Portugal, and Eire are countries whose economic life is based exclusively upon agriculture. European Russia, though building large industries since about 1925 on a Communist basis, is still essentially dependent upon farming and forestry.

**COMMUNICATIONS.** Europe's geographical structure and position in relation to other land masses favoured its growth as a world centre of communications. Transport throughout the continent itself benefited from the many navigable rivers, the wide plains, and the early rise of chains of settlements, and Europe possesses a close network of highroads and railways, insufficient only in the E. and S.E. The Danube, Vistula, Volga, Elbe, Rhine, and Loire, and to a lesser degree the Oder, Weser, Seine, serve as national, and some of them as international, waterways, and are interlinked by canals. They connect great ports whose prosperity was made possible by the many secondary seas penetrating into the continent. Most of the chief ports face the Atlantic: Hamburg, Bremen, Rotterdam, Antwerp, Southampton, Liverpool, Glasgow, Cherbourg, and Bordeaux. Others serve the Mediterranean, and include Marseilles, Barcelona, Genoa, Trieste, Brindisi, and Piraeus.

The European railway network, thickest in Belgium and next to that in Great Britain, covered, before the Second Great War wrought havoc upon it, just over 250,000 m.

#### European Air Lines

Motor highroads, a comparatively new feature, facilitated the development of road haulage on a large scale in the central and W. parts of Europe. Air lines on schedule were inaugurated in 1919 and rapidly augmented; they serve not only for the rapid transport of passengers, but of valuable or perishable goods as well. By 1939 the regular lines flown in Europe covered about 60,000 m., and total mileage flown in a year by aircraft under schedule reached 22 million miles, the number of



passengers exceeding 300,000, and freight and mail weighing 8,000-10,000 tons.

**ECONOMIC POSITION.** During the last hundred years, after it had become politically dominant, Europe, as the sphere of origin of capitalist economy, and of politico-economic colonisation, came to be the world's economic centre. Its own raw materials, however, proved progressively insufficient for requirements; in foodstuffs, likewise, Europe became more dependent on supplies from overseas, especially from the young colonial territories. In exchange for such supplies, Europe provided the whole world with finished goods and with capital. London, before the First Great War, was the world's money market and its most important wool exchange, while cotton interests looked to Liverpool, furriers to Leipzig, etc. This whole predominance of Europe was undermined by and in consequence of that war, which enriched countries overseas while forcing many hitherto industrially undeveloped ones to create their own factories, and transformed the U.S.A. from a debtor nation into the world's greatest creditor. It opened world markets for American and for cheap Japanese goods. Against such competition, Europe's weakened economic structure had an uphill struggle before the Second Great War.

#### Reasons for Europe's Economic Decay

The creation in 1919 of a number of small states all bent upon a maximum of independence from neighbours with whom previously they had been economically united; an ill-advised protectionist policy resulting therefrom; and Russia's withdrawal from European capitalist trade, were contributory reasons for the decay of Europe's economic pre-eminence. Attempts at countering these evils by pacific economic unification (see Europeanism) were opposed by Fascism and Nazism, which exploited misery and dissatisfaction in the direction of aggression. These false doctrines completed the downfall of Europe as the continent of civilization, prosperity, and leadership of the world; left it dependent for its food rations, raw materials, and working capital upon loans by the U.S.A. and colonial countries; and, though officially participating in the new United Nations organization, with severely clashing plans, aims, and ideologies among the main powers.

A movement, long rampant, but brought to a climax by the Second

Great War for the complete emancipation from Europe of the colonial peoples, was a consequence as well as a confirmation of Europe's decline (see India, Indonesia, Vietnam, etc.). Independence, if won by amicable arrangement, does not necessarily mean any decrease in the exchange of goods and services, but the political predominance over the rest of the world once possessed by Europe has ceased. Increase of skill, harder work, better scientific and technical equipment, and more nearly perfect organization of European man and his resources, and the example he may thus set in creating a harmonious, satisfied, and civilized community, can alone assure Europe any possible remaining superiority in the world.

Edgar Stern-Rubarth

**HISTORY.** The continent of Europe with its present contours emerged after the last ice age, probably not less than 20,000 years ago. For untold ages before, the greater part of it had been subjected to Arctic or tropical conditions of varying intensity, so that geologists divide the whole period into a succession of ice ages with non-Arctic intervals between them. Man had existed before the last ice age, but the new Europe was repopulated, not by the descendants of the "drift" men, but by men who, moving from warmer regions, made their way across it as the ice receded. In the course of some thousands of years tribes coming either from the east or out of Africa had spread thinly over the habitable area, settling in communities, acquiring to a limited degree the arts of agriculture, and developing the use of tools and utensils.

#### Beginning of the Aryan Invasion

Somewhere about 3000 B.C. began the migration of the Aryan races from a centre somewhere in Asia or in Russia. The presumption is that they were races hardened by life in northern and comparatively unproductive regions, and wherever they moved they went as conquerors, but rarely as exterminators. The evidence of their kinship is to be found in the evidently common origin of their languages and the common characteristics in bone and skull structure, as witnessed by their burying grounds. Those who spread over Europe are commonly divided into four main groups, Celtic, Greco-Italian, Teutonic, and Slavonic.

The first made straight across Europe to the W., dominating, though not exterminating, the

earlier inhabitants of modern France, Spain, and the British Isles. The second pushed S. towards the Mediterranean, and by 1000 B.C. were masters of the Balkan and, less completely, of the Italian peninsulas. The Teutons, moving later than Celts and S. Aryans, gradually occupied Scandinavia and modern Germany, and first came into contact with the Roman Empire when it was almost supreme over the whole area W. of the Rhine and S. of the Danube at the close of the 2nd century B.C. The movement of the Slavonic group came still later. A group of Aryans, less advanced than the Greeks and Italians, had long been in occupation of Austro-Hungary and Rumania and the mountain regions E. of the Adriatic, but whether they were nearer akin to the Greeks and Italians or to the Slavs is uncertain.

#### City States of Greece

Recorded European history begins somewhere after 2000 B.C. with pre-Aryan races who dominated the islands and coasts of the Aegean Sea, and developed an advanced civilization to which the modern excavations principally in Crete and at Mycenae bear witness. Between 1500-1000 B.C. the Hellenic Aryans mastered all the S. portion of the Balkan peninsula, the islands of the Aegean, and the W. coasts—though only the coasts—of Asia Minor. Greek political organization developed rapidly in the form known as the city state. The system was fostered by geographical conditions. Hellas, the area under Greek occupation, did not form a political unity, but was broken up into a large number of small communities, often hostile to each other, though sharing a sense of common race and tradition.

Maritime and commercial development followed naturally, as there was easy communication by sea with earlier civilizations and state systems of W. Asia and Egypt. Between 1000-500 B.C. a high political organization was attained by many city states, together with a remarkable intellectual and artistic activity. The Greeks were so far in advance of the rest of the world that it has been said that "nothing moves in the world which is not Greek in origin." The statement is not strictly true. Moving forces, notably Christianity, have come out of the East; Celts, Romans, and Teutons have all made contributions; but the truth remains that the most active forces of progress developed with the Greeks.

Later than the Greeks in the Balkan peninsula, and developing more slowly, the Latin or Italian branch of the same or of a kindred stock found its way through the passes in N. Italy, crossed the Lombard plain, and pushed S., breaking across the Apennines into the W. plains. There they fought with the earlier inhabitants, notably the Etruscans, supposed by some authorities to have been of the same race as the makers of the Cretan civilization. On the W. of the Apennines they, like the Greeks, developed politically on the city state system, the Latin states warring with each other, but uniting against the Etruscans on the N., and the new tribes of their own kinsfolk, Sabellians or Samnites, who followed them. Greeks and Italians alike seem to have passed through a stage when each state had an hereditary monarch to a stage when the monarchy was absorbed by an aristocracy, displaced in its turn by a military despotism or tyranny.

#### The Rise of Rome

The primacy among the Latin states, whose league stretched S. from the Tiber, was won towards the end of the 6th century B.C. by the Romans, whose city, Rome, founded according to tradition in 753 B.C., was the barrier fortress holding the Tiber between Etruscans and Latins.

The next 200 years formed the most brilliant period in Greek history, in which first the Hellenes stemmed the westward pressure of the Asiatic powers, then carried their own political, literary, and artistic development to its highest point, and finally, led by Alexander the Great, shattered the great empire of Persia. The passion of each state for individual independence and their mutual jealousies prevented the Greeks from building up a common national structure. Neither Athens nor Sparta succeeded in establishing her own supremacy over the rest of the states; Macedon at last won the leadership about 340 B.C., but failed to create a united empire.

Meanwhile Rome, after a severe struggle, broke up the Etruscan power, which received its *coup de grâce* at the hands of Celtic invaders from the N., who penetrated as far as Rome (394 B.C.), but then rolled back beyond the Apennines to the plain of the Po. It would appear that long after the first Celtic migration, which had passed Italy by, a second great Celtic flood poured across Europe till it collided with its own Celtic predecessors. The result was that the S. wing, being beaten

back, forced its way into Italy and occupied the N. plain.

The Romans blocked the Celtic invasion of Italy, and, freed from the severe Etruscan pressure on the N., gradually came to dominate the Latin states and the kindred tribes, first known as Sabines and then as Samnites, who were pushed down on the E. and S., after the Latin occupation of the lands W. of the Apennines. Rome, compelled by her position to maintain a political organization adapted to military needs, won in Italy an undisputed ascendancy over her rivals.

Meanwhile Hellas had attained the high-water mark of her progress with Alexander the Great, whose death in 323 B.C. left his uncompleted empire to a century of disintegration. That same century, 300-200 B.C., saw the great struggle between Rome and the Semitic power of Carthage, which had established itself in N. Africa, to some degree in Sicily, and in Spain. Carthage was not decisively crushed until 202 B.C. Italy had supported Rome in the momentous conflict; the result of which was that not only was her ascendancy overwhelmingly confirmed in Italy, but her sway was also established in the Spanish peninsula, with its mixed population of Celts and pre-Celtic Iberians.

#### Roman Power Expands

During the next 170 years (200-30 B.C.) the dominion of the Roman republic expanded. The conquests of Julius Caesar in Gaul (58-50 B.C.) completed the subjection of all Europe W. of the Rhine and S. of the Danube, including the whole Celtic or partly Celtic area, except Britain, of which the part now called England was absorbed 100 years later. But all along the Rhine and the Upper Danube, the Teutons were now pressing upon the Roman frontier. The system which had built up the might of the Roman republic was not adapted to the administration of so heterogeneous an empire. Concentration of control was a necessity. Caesar gathered in his own hands the powers which enabled his genius to shape an imperial system under a single control.

For 400 years and more, the civilized world meant the Roman empire, which covered much of Europe and parts of Asia and Africa. On its borders there was incessant war: within it reigned the Roman Peace, save when the death of an emperor afforded a commander in some distant province the chance of snatching at the imperial purple.

W. of the Adriatic and the Rhine, the peoples of the continent

became thoroughly Latinised in language and political ideas, though across the Channel Latinism was little more than a superficial veneer which touched not at all either Celtic Ireland or the Celtic north of the island of Britain. In the Balkan peninsula, Hellenism held its own against Latinism except in the one trans-Danubian province of the empire, Dacia, the modern Rumania, planted with military colonies from Italy.

Towards the end of the 3rd century A.D. Teutonic hordes were surging against the Roman barrier, pressing now southward as well as westward upon the middle and lower Danube. At the close of the 3rd century the imperial system was reorganized by Diocletian, and a few years later by Constantine, who transferred the headquarters of the empire in 324 from Rome to Byzantium, which he renamed Constantinople. At the same time, after three centuries of repression and persecution, Christianity became the popular religion under the imperial sanction, and the ecclesiastical organization of the Church was officially recognized. One result of this was that Rome acquired the religious primacy of Christendom when her political primacy was lost.

#### Barbarian Irruptions

With the beginning of the 5th century, when the empire was parted into E. and W. under the two sons of Theodosius, the flood-gates of the imperial frontiers burst, and the Teutons swept over the barrier. The Visigoths burst into Italy under Alaric, and moved W. into S. Gaul and Spain, whither they had been preceded by Vandals and Sueves. Behind the Goths came a more terrible conqueror, Attila and his Huns, not Teutons, but Tartar hordes who for two generations had been moving across S. Russia from Central Asia. The Goths in the W. had chosen to profess allegiance to the empire; they helped the imperial armies to turn back the Huns at the battle of Châlons, 451.

The dispersal of the Huns made way for fresh Teutonic irruptions. The Ostrogoths, after overrunning much of the Balkan peninsula, turned W. and established a new Gothic dominion in Italy under Theodoric, who called himself a lieutenant of the single emperor now reigning at Constantinople. Then at the beginning of the 6th century the Teutonic Franks swept over the Rhine and made themselves masters of the land which still bears their name, though the Franks themselves never completely Teutonised the country,

which remained persistently Latin. At the same time the native customs of the Franks in France, as of the Goths in Spain, fusing with the established Latin system, produced the social and political system known as feudalism. Other Teutonic tribes followed; Burgundians into the Rhône valley, and Lombards into the Lombard plain. The latter established their lordship over most of Italy, the Ostrogoths having been extirpated by the generals of Justinian, whose successors failed to retain the domination of the E. over the W. But nowhere did the Teutons effectually Teutonise populations already Latinised. Italy, France, and Spain remained essentially Latin, though Latinism hardly expanded E. of the Rhine or N. of the Danube.

With the rise of Mahomedanism in the 7th century, Europe was once more threatened with Orientalism. Early in the 8th century the Moors invaded Spain and drove the Christians into its N. corners. But when they flooded over the Pyrenees, their armies were shattered by Charles Martel at the battle of Tours or Poitiers, 732, and the tide was rolled back for ever behind the Pyrenees, though Saracen sea-rovers established a footing in Sicily. In the E. the Mahomedan onslaught had been hurled back 14 years before by the emperor Leo the Isaurian under the walls of Constantinople. Except in the S. of Italy all semblance of control by the emperor at Constantinople vanished from W. Europe.

#### The Empire of Charlemagne

Charlemagne now revived the W. Empire. He crossed the Pyrenees and drove the Moors S. of the Ebro. He completed his father's work of crushing the Lombards in Italy. His armies smote the heathen Saxons in the N. and the Bavarians in the S., and compelled them to adopt Christianity; still pushing E., they shattered the Mongolian kingdom of the Avars in Hungary. At the instance of the pope, Charles was crowned emperor in Rome on Christmas Day, 800. When he died in 814, the Elbe and the Adriatic were approximately the E. boundaries of the new Holy Roman Empire which he had created. The Danube still remained in effect the N. boundary of the Byzantine empire.

Under the grandsons of Charlemagne his empire parted into three domains, the W., which shaped itself into the kingdom of France, the E., which was German, and the intermediate, "middle," or Burgundian, which stretched from the North Sea to the Gulf of Lions, and

included most of Italy, the S. of which, however, still belonged to the E. Empire. The crown of the Holy Roman Empire generally went with the E. or German kingdom. Burgundy broke up, part going with France and part with Germany, but never with a definite bond, while Italy became a congeries of dukedoms and counties over which the emperor on the other side of the Alps could exercise little authority. When the house of Charlemagne died out in Germany, the crown of the German kingdom, of the Holy Roman Empire, passed by election to the dukes of Saxony. The first, Henry the Fowler, was never crowned emperor; but he and his son, Otto the Great, stemmed the onrush of the third Mongolian horde which occupied Hungary, the Magyars, who nevertheless retained permanent possession of that tract.

#### The Middle Ages

The close of the 10th century, then, is the era of transition from the chaos of the earlier Middle Ages to what is generally more distinctively meant by the medieval period. During the 9th and 10th centuries the sea-rovers from Scandinavia had planted their colonies of Danes or Northmen in the British Isles and in the N. of France, and had shaped their own kingdoms in Norway, Denmark, and Sweden. In the 5th and 6th centuries the Teutonic English had conquered more than half the island of Britain, and in the 10th century England had become a fairly consolidated state.

France was on the way to consolidation under the house of Capet, which had displaced that of Charlemagne, but as yet the king of France was little more than a premier baron amongst many, some of whom ruled wider domains than the king himself. Spain was still mostly under the Saracen sway, though the Christian princes were soon to emerge from their northern fastnesses to win it back, establishing the kingdoms of Castile and Leon, Portugal, Aragon, and Navarre.

In the Spanish kingdoms, as in France, the king was hardly more than a premier baron. Central Europe regarded the German king as its head, though scarcely as its ruler, while to W. Christendom, in his character of emperor, he represented the idea of Christendom as a unity. The popes, as spiritual heads of Christendom, now began gradually to claim an authority higher than that of any lay potentate. Outside the empire on the E. the Slavs were establishing the Polish and Bohemian king-

doms, and had already given half the Balkan peninsula and the whole Danube basin a Slavonic character, though they owned the supremacy of the emperor at Byzantium. The latter, with his hardly held dominion in Asia, barred the door into E. Europe against the Mahomedans.

The new age was the age of feudalism, which before the end of the 11th century had established itself everywhere. Theoretically, the king owned every inch of soil in his kingdom. He had granted great tracts or small to his servants on condition of military service. They in turn had granted portions upon like conditions, while every one had settled husbandmen upon the soil, allowing them patches on condition of agricultural and other services to the lord.

But outside England, the tenant generally owed his services to his immediate lord and was bound to fight for him against anyone else, even the king. Hence if one of the king's men or barons accumulated enough territory, he had at his back an army of tenants with which he could levy war against the king. The royal authority depended upon the loyalty to the king of a proportion of the baronage. Thus the French dynasty and each German dynasty tried to expand the crown estates at the expense of the great barons. In France the counts of Anjou acquired by marriage the dukedoms of Normandy and Aquitaine as well as the independent kingdom of England. Essentially the Hundred Years' War between England and France in the 14th and 15th centuries was a struggle between the crown and the duke of Aquitaine, who happened also to be king of England. The final victory of the French crown, and its absorption of the duke's dominions, cleared the way for the final establishment of an absolute monarchy in France.

#### Pope and Emperor

In Germany, on the other hand, the monarchy was elective; each time that the succession changed, the new dynasty had to start afresh the absorption of feudatory territory, and consequently the German kings failed to establish absolute monarchy. Germany remained an aggregation of estates great and small, over which the emperor exercised little control.

The papacy again established its own supreme authority over the whole ecclesiastical organization of W. Christendom, and sought to assert that authority over all lay potentates. Within the empire, in Germany and in Italy, the struggle between the pope as the spiritual head of Christendom, and the

emperor as its temporal head, helped the baronage to maintain their independence, since they could support emperor or pope as best suited themselves.

Europe, then, in the second as in the first half of the Middle Ages, shows nothing like a system of organized states. Through the Scots' War of Independence and the Hundred Years' War between England and France, the defined kingdoms of England, Scotland, and France were consolidating themselves during the four centuries which followed the Norman conquest of England in 1066. Spain grew into a group of four separate kingdoms, the Moorish kingdom of Granada in the S., and the kingdoms of Portugal, Castile, and Aragon, to the last of which Sicily was attached in 1282. Central Europe—Germany—was only a loose confederation of states in a state of perpetual flux.

Italy became practically a collection of city states, in which there was developed an intellectual life far in advance of that of the rest of the world, especially during the 14th and 15th centuries. On the N. of the empire lay the Scandinavian kingdoms; to the E. of it Poland, Bohemia, which had a connexion with the empire, and Hungary. S. of Hungary chaos for the most part reigned on the Balkan peninsula, though Byzantium held back the Asiatic invaders till its fall

in 1453, when a Turkish dominion was established in the European continent E. of Poland. The development of a Russian empire was prevented by the great Tartar incursion in the 14th century; but by the end of the 15th the Muscovite kingdom was shaping itself.

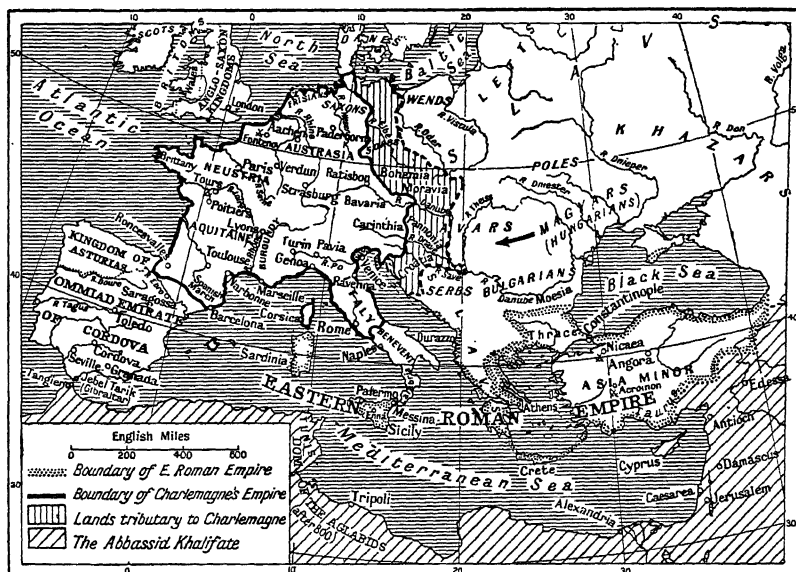
The latter half of the 15th century marks the transition from medieval to modern Europe. The union of the crowns of Castile and Aragon by the marriage of Ferdinand and Isabella, 1469, unified the Spanish monarchy. The imperial crown had passed to the Hapsburg, Frederick III of Austria, in whose dynasty it became hereditary. The use of gunpowder was to revolutionise warfare. The voyages of Christopher Columbus and Vasco da Gama opened the ocean pathway to a new world in the W. and to the

GROUP	LANGUAGE	PERCENTAGE
LATIN 26%	FRENCH	8.4
	ITALIAN	8.4
	SPANISH	3.2
	RUMANIAN	2.8
	PORTUGUESE-GALICIAN OTHERS	1.7 1.5
TEUTONIC 32%	GERMAN	17.5
	ENGLISH	10.0
	DUTCH-FLEMISH OTHERS	2.5 2.0
SLAVONIC 32.6%	GREAT RUSSIAN	13.8
	UKRAINIAN	7.6
	POLISH	4.4
	SERBO-CROAT	2.1
	CZECH	1.6
	WHITE RUSSIAN OTHERS	1.5 1.6
OTHERS 9.4%	HUNGARIAN	2.0
	GREEK	1.0
	OTHERS	6.4

Europe. Table showing the division of the peoples of modern Europe into racial and linguistic groups, with the percentage, in each group, of the total population of about 500 millions

E., hitherto cut off from Europe by the Muslim wall which the crusaders had failed to break through. The intellectual revival in Italy received a new impulse from the revived study of ancient literatures following upon the fall of Constantinople and the dispersion of Greek scholars in the W. Men were beginning to challenge the doctrines of the Church itself.

With the 16th century the history of Europe becomes international, as never before. The struggle of individual states for general European ascendancy now begins, and against this effort the common interest in the preservation of a balance of power makes itself felt. Across this for 150 years cuts the religious struggle between Protestantism and Romanism, and this again is crossed by the struggle for dominion over colonial lands.



Europe. In the 8th and 9th centuries the supreme historical event was the substitution of the Holy Roman for the Eastern Roman Empire as the predominant power; as established by Charlemagne it comprised Gallo-Latin Neustria, Teutonic Austrasia, and Lombard Italy. In Spain the Omniad emirate was set up by Abd-ur-Rahman. In the Near East, Bulgarian and Serbian kingdoms were coming into existence. Islam controlled Africa and western Asia, except Asia Minor

The accident of marriages conveyed to one man, Charles V, the entire Spanish inheritance, including Sicily, S Italy or Naples, the Netherlands, and the whole Hapsburg territorial inheritance in Germany, while he also succeeded his grandfather as emperor in 1519. A year later the floodgates of the Reformation were opened by Luther's defiance of the papacy. The German inheritance of the Hapsburgs was transferred to Charles's brother Ferdinand, who acquired for his own house the crowns of Hungary and Bohemia, and the Hapsburg monarchies became the barrier between Europe and the Turks. During Charles's reign Protestantism was established in Scandinavia, over the N. half of Germany, and in the N. half of the Netherlands; while it was planted as yet insecurely in England, Scotland, and France.

#### Religion and Politics

When Charles died in 1558 his son Philip II was ruling over the Spanish dominions and the Netherlands, Ferdinand was emperor, and a truce had been confirmed between the Protestant and Catholic states of the empire. By the end of the century Philip had virtually lost the N. Netherlands, which became the United Provinces of the Dutch Republic, while the Catholic S. still remained the Spanish Netherlands. England and Scotland had both become definitely Protestant, soon to be united under one crown; while France remained Catholic, with freedom of worship secured to the Protestants, and her foreign policy directed by purely political considerations irrespective of religion. Maritime ascendancy, once enjoyed by Italian city states had first passed from them to Portugal and Spain, but was now decisively transferred to England and the Dutch states.

The struggle of the religions was fought out in the Thirty Years' War (1618-48), the emperor himself championing the Catholics, while Gustavus Adolphus of Sweden intervened on behalf of Protestantism. Its outcome left the division between Catholic and Protestant states in Germany very much where it had been at the beginning. It also broke the last attempt to establish an effective central control of the empire in the hands of the emperor. And meanwhile Spain had become practically a secondary power, while France, by Richelieu's policy, had developed a strong central government.

In the next phase, Louis XIV of France, a monarch whose abso-

lutism in his own country was almost unqualified, sought through a long series of wars, 1667-1713, to enlarge the borders of France and to make her the dictator of Europe. For 40 years the main resistance came from Spain and Austria, and from the little Dutch state under William of Orange, whose accession to the thrones of England and Scotland brought Great Britain into the European struggle, of which the last phase at this stage was the War of the Spanish Succession (1702-13). That war gave Spain herself to a Bourbon, Philip, a grandson of Louis, who was himself succeeded on the throne of France by his great grandson Louis XV. It also transferred the Spanish Netherlands to Austria, together with the Two Sicilies.

Meanwhile within Germany the electorate of Brandenburg had been erected into the kingdom of Prussia (1701); and outside, England and Scotland had been incorporated in the kingdom of Great Britain (1707), while in the E. Russia had at last been organized into a consolidated dominion by Peter the Great, and Sweden, under Charles XII, had made her last effort to retain among the European powers the position won for her by Gustavus Adolphus. Britain had now emerged as the supreme maritime power, and established naval bases at Gibraltar and Minorca. The reign of Louis XV in France (1713-74) covers an era of protracted European struggles. The last aggressive effort of Turkey was crushed in 1718; Russia established herself on the Baltic and the Black Sea, and extended her boundaries eastwards.

#### Prussia and Silesia

The War of the Polish Succession (1733-38) set up a Bourbon dynasty in the Sicilies. The War of the Austrian Succession (1740-48) saved the Austrian dominion from disintegration, except for the annexation of Silesia by Frederick II of Prussia—a robbery which led the way to a regrouping of the powers in the Seven Years' War (1756-63). Great Britain, the former ally of Austria, now supported Prussia, which had to defend itself against the French on the W., the Austrians on the S., and the Russians on the E. Great Britain's part in the war was mainly on the seas and beyond them, where she fought the French in America and in India, and in effect turned them out of both. In Europe, the war confirmed Prussia as a first-class power, still in possession of Silesia; but no fighting was needed when, in 1772, the tsarina

Catherine arranged with Frederick of Prussia and with Austria the first partition of Poland, a partition carried farther in 1793 and 1795, when the whole of Poland was absorbed by one or other of the three.

The development of the last 300 years had established despotic governments in every state in the European continent, large or small, with the exception of Switzerland and Holland. The despots were generally well disposed towards their subjects. Many tried to improve the conditions of their people, and some succeeded. But, broadly speaking, most of the populations lived actually or approximately in serfdom. Political liberty was non-existent, and between the classes there was an almost impenetrable social barrier, while the burdens of taxation and service pressed most heavily upon those least capable of supporting them.

#### The French Revolution

The summoning of a popular assembly in France—the states-general of 1789—in the hope of discovering a panacea for the imminent financial ruin of the country, proved to be the first step in a wide revolution. Successive assemblies passed from advocating the abolition of privileges to demanding the abolition of the privileged. The extremists captured the control of the government, first emasculated and then wiped out the monarchy, and went on to proclaim themselves the liberators of Europe from the tyranny of monarchs and aristocrats.

Great Britain, whose constitutionalism had been the model of the reformers before they were swept away by the revolutionary tide, was swung into the vortex when the new republic tore up treaties, and set about annexing the Austrian Netherlands in 1793. Long before the terrors of the revolution within France had exhausted themselves, the armies of the republic, reckless of established methods, were facing and routing the orthodox armies of the monarchies. Prussia and Spain soon retired from the struggle; Bonaparte's Italian campaigns broke Austria. Bonaparte betook himself to Egypt; Britain, fighting on alone, won the mastery of the Mediterranean; Austria returned to the attack, supported by Russia. The return of Bonaparte and his establishment as First Consul of France was followed by the shattering of the new coalition, and even by the accession of Great Britain to the peace of Amiens, 1802.

In 1803 the Franco-British duel was renewed; two years later a new coalition was formed. Nelson

sealed the naval supremacy of Great Britain at Trafalgar, 1805, but Napoleon, now emperor of the French, shattered the new coalition at Austerlitz. Prussia, aroused at last, took up the challenge and was crushed at Jena, 1806, and Napoleon made his peace with Russia at Tilsit in 1807, and set about the reconstruction of Europe according to his own fancy. His attempt to appropriate the Spanish peninsula brought Great Britain into the war for the first time as a military power, 1808. For five years Napoleon's generals strove in vain to drive the British into the sea. But Napoleon quarrelled with the tsar, and his Moscow expedition in 1812 ended in irretrievable disaster. The uprising of the peoples rather than of the governments overwhelmed him, he was compelled to abdicate in 1814, and though he reappeared to make a last bid for victory, he was finally crushed at Waterloo, 1815.

The congress of Vienna restored the map of Europe so that the state boundaries were much as they had been in 1792, except that the Netherlands were formed into a new kingdom. The old dynasties were replaced and the old despotisms renewed, the former states of the empire forming the German Confederation. But the French Revolution had kindled new ideas of liberty, partly democratic, partly nationalist, and despite the efforts of Metternich, those movements could not be crushed. Greece broke free from her subjection to Turkey; France turned out the Bourbons and established the constitutional Orleans monarchy in 1830. The S. Netherlands separated from Holland in 1839 and became the Belgian kingdom. Liberals and reactionaries did battle in Spain and Portugal.

#### Austria and the German Confederation

Then in 1848 came the Year of Revolutions. In almost every country, nationalist, constitutional, or democratic movements came to a head. Generally, though not always, the Reaction was for the time victorious. France made herself into a republic, but in five years the nephew of Napoleon had turned the republic into the Second Empire. Limited constitutions were conceded in sundry German states. Austria kept her grip on the diverse portions of her empire, and though the title of the Holy Roman Empire had been dropped since 1806, she still retained her place as leader, or as joint leader with Prussia, of the German confederation. The mutual jealousies and distrust between Great Britain and Russia, the causes of which

were more Asiatic than European, were a constant disturbing factor in European affairs.

The three great movements afoot were towards the liberation of the Balkan peninsula from Turkish rule, towards the unification of Italy, and towards the unification of Germany under the headship of Prussia. The rising of N. Italy under the leadership of Victor Emmanuel, king of Sardinia, supported by Napoleon III, in 1859, liberated most of N. Italy from Austria and from the temporal control of the papacy and created the kingdom of N. Italy. The revolt of Sicily and Naples against the Bourbon dynasty in 1860 was followed by the adhesion of S. Italy to the N. kingdom, and in 1861 the united kingdom of Italy was established, though Austria still held the N.E. corner and Rome still belonged to the pope. In 1871, however, it was united to the new kingdom of which it was made the capital.

#### Policy of Bismarck

Bismarck organized the Prussian military power, contrived the annexation of Slesvig and Holstein from Denmark, and procured the Seven Weeks' War with Austria in 1866, which in effect ejected Austria from the German confederation and gave Prussia decisive ascendancy therein. Incidentally, Italy was rewarded for her assistance to Bismarck by the acquisition of Venetia. Bismarck's policy achieved its triumph with the Franco-Prussian War of 1870-71. The recovery of the Rhine provinces from France was accompanied by the recognition of the king of Prussia as German emperor and by the consolidation of the new German Empire under Prussian direction, with a machinery which, for the first time in Germany's history, brought her under a single control and made her the first military power in Europe. Another outcome of the war was the establishment of the third republic in France.

Turkish misrule was the excuse or justification of the wars with Turkey upon which Russia entered in 1853 and 1877. In both, British intervention was responsible for the preservation of Turkey, but those wars brought about the virtual independence, first of Rumania and then of the Slav states of Bulgaria, Serbia, and Montenegro, while Bosnia and Herzegovina were placed under Austrian administration, paving the way for annexation after an interval of 30 years. The outstanding features, however, of the European situation in the latter years of the 19th

century were the alliance of the three emperors, and the substitution for it of the alliance of the three powers, Germany, Austria-Hungary, and Italy, which was answered by the alliance between France and Russia. The settlement of outstanding differences between Great Britain and France in 1905 prepared the way for the Triple Entente between Great Britain, France, and Russia, which became an accomplished fact in 1907, while its solidarity was proved to the great dissatisfaction of Germany in 1911 by the British support of the French in connexion with the Agadir incident. The Balkan Wars of 1912-13 liberated the Balkan States from the last relics of Turkish sovereignty, but failed to establish a concord among them, whereof the fruits were later to become apparent.

Two more events prior to 1914 have here to be noted. In the 15th century Denmark, Norway, and Sweden had been united under one crown; in the 16th Sweden had separated herself, but Norway had remained attached to Denmark. At the European reconstruction in 1815 Norway had been taken from Denmark and attached to Sweden. The union, however, had never been harmonious or satisfactory to Norway, and in 1905 she procured her establishment as a separate kingdom. In 1908 a revolution in Portugal expelled the dynasty and inaugurated a republic.

#### The Climax of Power Politics

The causes, campaigns, and conclusion of the most devastating war in history up to that time—it lasted from July 28, 1914, to Nov. 11, 1918—are described under First Great War. The chief protagonists at the start were the central powers, Austria-Hungary and Germany, against Russia and France. Great Britain immediately joined the latter group, among which were Serbia and Belgium as victims of attack; Turkey threw in her lot with the central powers, as later did Bulgaria; in 1915 Italy broke with her allies and joined the Entente Powers; by 1917 the German submarine campaign had brought the U.S.A. into the war. That year Russia collapsed in two internal revolutions; and another year was needed to defeat the central powers, the first break coming in Bulgaria and Turkey. Peace making occupied most of 1919-20 (see St. Germain-en-Laye, Treaty of, and Versailles, Treaty of). Czecho-Slovakia and Yugoslavia appeared as new states; Poland was resurrected; Finland, Estonia, Latvia, and



Lithuania gained independence through the disintegration of the old Russian Empire.

#### A. D. Innes

The treaty of Versailles, signed in the hall of mirrors on June 28, 1919, was followed at brief intervals by treaties with Austria, Hungary, Bulgaria, and Turkey which registered the overwhelming victory of the Allies over the central powers and their satellites in the First Great War. Like all dictated settlements, they were bitterly resented by the defeated parties. The new frontiers and the limitations imposed on the sovereignty of the five states could be maintained only so long as the unity of the victors was preserved. This condition, however, was not fulfilled. The senate of the United States, reverting to its traditional isolationism, declined to approve the treaty of Versailles (which included the covenant of the League of Nations) without reservations which President Woodrow Wilson felt unable to accept.

This damaging blow at the new order was followed by a rift in the *entente cordiale* (q.v.). After vetoing the French claim to sever the whole of German territory W. of the Rhine from the new Reich, Great Britain and the United States offered France a promise of military support in the event of renewed German aggression. The guarantee enshrined in the tripartite treaty of June 28, 1919, however, was joint, not separate, and when the American senate repudiated the signature of the president, the obligation on Great Britain lapsed. Possessing neither the coveted territory nor the Anglo-American guarantee, France felt a legitimate grievance.

#### French Occupation of the Ruhr

Negotiations in 1921-22 for a British guarantee, initiated by Briand, broke down primarily because the Lloyd George government refused a long-term commitment. Henceforth France felt that she must look after herself. She concluded an alliance with Poland, and Poincaré's decision to occupy the Ruhr in Jan. 1923, on the ground that German reparations were in arrears, destroyed what little vitality was left in the *entente cordiale*. Convinced that France's step was legally unjustifiable, the British and American governments withdrew their troops from the Rhineland. The economic results of the occupation of the Ruhr strengthened Anglo-American disapproval, for the mark lost all value and the industrial

recovery of Germany was blocked. Great Britain and France agreed that Germany should remain permanently disarmed; but while the former desired her economic rehabilitation in the interest of European prosperity, France believed that to render her harmless it was necessary to keep her poor. When Stresemann called off the passive resistance of the Ruhr in the autumn of 1923, and a commission under C. G. Dawes (q.v.) was appointed to examine afresh the reparations problem, Poincaré congratulated himself on the success of his policy. Yet his position was not so strong as he believed. Italy, ruled by Mussolini since 1922, was with him, but her share in the Ruhr adventure was small. In May, 1924 the French chamber elected in 1920 came automatically to an end, a majority of the left was returned, and new pilots set out on a fresh course.

#### Treaty of Locarno

For the next six years, the dark clouds which had overhung Europe seemed to be melting away. A temporary limitation of naval armaments had been arranged at the Washington conference in 1922. The new French government, with Herriot at the head, believed with Briand that Frenchmen "must learn to speak European." The French troops were withdrawn from the Ruhr, a new and stable currency was introduced in Germany, and the economic recovery of Europe proceeded apace. In 1925 Stresemann, the German foreign minister, informed Paris and London that he was willing to recognize the *status quo* on Germany's W. frontiers, in other words, to surrender all claim to Alsace and Lorraine. After months of negotiation the territorial stabilisation of the west was registered in the treaty of Locarno, the joint work of Stresemann, Briand, and Austen Chamberlain, with the assistance of Lord D'Abernon, British ambassador in Berlin. Great Britain and Italy pledged themselves to resist attack on the Franco-German and Belgo-German frontier, whether it came from Germany or France. A similar renunciation of claims to revise the new German-Polish frontier, strongly urged by France and Poland, was refused by Stresemann, though he promised not to attempt a change by arms. British opinion approved both the undertaking to fight for the *status quo* in the west and the refusal of a similar

obligation in the east. A year later, in Sept., 1926, Germany joined the League of Nations with a permanent seat on the council. Of the five great powers of Europe, only Russia was absent, and the prestige of the League increased from year to year. When the assembly met every year in Sept., all eyes were turned to Geneva, where Lord Cecil, Nansen, and other "good Europeans" laboured zealously for an organized world.

#### Kellogg Pact of 1928

The next milestone on the road to peace was the signature of the pact of Paris, popularly known as the Kellogg pact, on Aug. 27, 1928. In 1927, on the tenth anniversary of the entry of the United States into war, Briand proposed to the American people a mutual engagement to outlaw war for a hundred years. Since a conflict between such old friends was unlikely, the American secretary of state proposed that all states should pledge themselves to renounce war, not merely for a century but for ever. The American project was accepted without enthusiasm by the French, who resented the absence of military sanctions. Their apprehensions were diminished by Kellogg's formal declaration that the signatories were not debarred from the right to defend themselves against unprovoked attack, and that violation of the pact would automatically release the other parties from all obligations to the treaty-breaking state. Since belligerents almost always assert that they are fighting in self-defence, the reservation reduced the renunciation of war to an empty phrase. Moreover, the British government reserved liberty of action in "certain regions the welfare and integrity of which constitute a special and vital interest for our peace and safety." The reference to Egypt was clear enough. If ever an international agreement deserved the name of a scrap of paper, it was the pact of Paris, signed though it was by most states in the world.

In the same year, 1928, the League assembly approved a general act for the peaceful settlement of international disputes, providing for conciliation in cases unsuited to the Hague Court. Though Great Britain acceded to the general act only in 1931, the MacDonald government decided in 1929 to sign the optional clause of the statute creating the permanent court of international

justice at the Hague. A few countries including France had already signed this, but had not ratified their signatures. Though important cases had been referred to the court with satisfactory results, only states which voluntarily accepted its verdicts in advance were under any compulsion to make use of it. Other states, large and small, now came trooping in. The British government, however, made an important reservation by excluding domestic and inter-Imperial questions. A further effort to organize peace—Briand's scheme for a European federation outlined at the League assembly in 1930—met with little approval and was dropped.

Two more indications of the general desire to reintegrate Germany into the life of Europe occurred during these years of hope. The Dawes plan for the payment of German reparations was superseded in 1929 by the Young plan, reducing the burden and creating the bank of International Settlements (*q.v.*) at Basel; and the last armies of occupation evacuated the Rhineland in the summer of 1930, five years before the date fixed at Versailles. The most unsatisfactory feature in the European landscape was the exclusion of Russia from the European family.

A third chapter opens with the Reichstag elections in September, 1930, when the Nazi deputies jumped from 12 (elected in 1928) to 107 (out of 475). The main cause was the impact of the American economic blizzard of 1929 which raised the figures of German unemployment to seven millions. Stormy weather was obviously ahead, and two of the most experienced pilots had been removed in 1929, Stresemann by death, Austen Chamberlain by a change of government. Only Briand remained, the ghost of his former self. Brüning possessed no stable majority. Everything combined to favour treaty-breaking and aggression.

#### Blows at the League

The first blow was struck in 1931 when Japanese troops seized Manchuria from the powerless hands of the Nanking government. The League of Nations expelled the offender, but no state cared to risk war by imposing economic sanctions. A second blow was the fiasco of the disarmament conference which met at Geneva in 1932. A third fell when Hitler as the leader of the largest party in the Reichstag became chancellor

on Jan. 30, 1933, resigned from the League, and solved the problem of unemployment by wholesale rearmament. In March, 1935 he announced the return to conscription, and Goering revealed that Germany possessed a formidable air force. More galling fetters were struck off in March, 1936, when German troops marched into the demilitarised zone of the Rhineland. Though this *coup* violated not only the dictated treaty of Versailles but also the freely negotiated Locarno pact, no action was taken by Great Britain or France, where the dread of another war outweighed the promptings of self-preservation. Here was the turning point in post-war history, since a stout wall in the west would enable Hitler to strike out in central and eastern Europe. Though Baldwin declared that her frontier was now on the Rhine, Great Britain had returned to her old system of a small voluntary army, and France lacked vigorous leadership. Foch, Clemenceau, and Poincaré were gone; weak coalitions rose and fell; the generals trusted to the Maginot line; and the output of munitions and armaments was small.

#### Mussolini Invades Abyssinia

The Versailles system, resting first on the political cooperation of Great Britain, France, and Italy, and secondly on the military predominance of France on the Continent, ended in 1935, when Hitler broke Germany's military chains and Mussolini invaded Abyssinia. Though Italy had been on the winning side in the First World War, she was disappointed with her share of the spoils, and thirst for colonial territory proved stronger than loyalty to her late allies. The crime was frowned on by the League but no effective action was taken. Before dispatching troops, munitions and poison gas through the Suez Canal, Mussolini (in an interview with Laval) assured himself that France would not make any difficulties; and the Baldwin-MacDonald cabinet, fearful of driving him into the German camp and disinclined to risk the Mediterranean fleet in vindicating the authority of the League, played for safety. The policy of limited economic sanctions, while failing to prevent the conquest of an unarmed and primitive community, angered the Italian people and made them look round for new friends. The dictators now grasped each other's hands. Visits were

exchanged, the Axis came into being, and effective Italian and German aid was rendered to Franco's rebellion in Spain. The adhesion of Japan created what Hitler called the world-triangle. Three of the seven Great Powers were now banded together for aggression, which the other four were too disunited to check. The United States had left the stage. Russia, though she had joined the League in 1934, was sundered from the western powers by old suspicions and ideological differences. France, racked by party strife, was unready for another major struggle. Britain was weakened by sharp antagonism between the supporters of Neville Chamberlain's policy of appeasement and the partisans of rapid rearmament led by Churchill, who foretold war with Germany.

#### The Axis in Action

In March, 1938, Hitler seized Austria without opposition. The autocratic Schuschnigg regime undermined by the Austrian Nazis and detested by the Socialists whose power had been broken by Dollfus, collapsed like a house of cards, and Mussolini forgot his old pledge to stand by Austria to the end. Czechoslovakia, now vulnerable from the south as well as from the north and west, was the next victim on the list. Using the grievances of the Sudeten Germans as a pretext, Hitler secured the consent of Daladier and Neville Chamberlain at Munich in Sept., 1938, to the partial occupation of the country, though France was an ally and Great Britain had encouraged hopes of support if Germany attacked. Russia, though also an ally, was not invited to the Munich conference. Less than six months later, in March, 1939, President Hacha, the successor of Benes, who resigned after Munich, was summoned to Berlin and compelled by the threat of the immediate bombing of Prague to surrender the rest of his country.

#### Hitler Turns on Poland

Hitler now turned to the third item on his agenda of aggression. The denunciation of his ten years' pact of non-aggression with Poland concluded in 1934, followed by the customary vilification of the prospective victim, revealed where the next blow would fall. Hoping to avert it, Great Britain promised support in the event of an unprovoked German attack; and with France made proposals to Russia for the organization of mutual defence against aggression. But

Russian suspicions of the western powers were deep-seated, and the negotiations came to an abrupt end with the announcement on Aug. 24, 1939, that Germany and Russia had the previous day signed a ten-years' mutual non-aggression pact.

Despite categorical declarations that Great Britain would stand by her new ally, and despite the existence of a Franco-Polish defensive alliance, German troops crossed the 1,200-mile long Polish frontier from the north, west, and south on Sept. 1, 1939. On the 17th, Russia marched in from the east, Warsaw, after ruthless bombing, fell on the 27th, and the Polish republic ceased to exist.

The winter of 1939 was spent by Hitler in preparations for the attack in the west, which was launched in April, 1940. Denmark offered no resistance, and, despite British assistance, Norway was conquered without much difficulty. In May, 1940, Hitler invaded the Low Countries. The small Netherlands army surrendered on May 14 after four days, the Belgian on the 28th. The bulk of Great Britain's expeditionary force of some 250,000 men, surrounded at Dunkirk, was evacuated safely between May 26 and June 3, but was obliged to leave its equipment behind. The French government, paralysed by defeatism, German intrigues, and a stab in the back by Italy, signed an armistice on June 22.

#### Britain Stands Alone

Hitler assumed that he had won the war and that the air attack he launched on southern England in Aug. would clear the way for invasion. But months of bombing of British cities failed to break the spirit of the people.

For a year the British Empire stood alone. Hitler's attack on Russia in June, 1941, provided it with a new ally. In Dec. of the same year Japan's treacherous attack on Pearl Harbour in the Hawaiian Is. brought in the U.S.A. The campaigns affecting Europe which followed are described under Europe, Liberation of Western; North Africa Campaigns; Russo-German Campaigns, etc.

When the Allies crossed to Sicily and South Italy, Mussolini was overthrown by his old colleagues, Marshal Badoglio and the king, and Italy changed sides. France was invaded from the north and south, and, while Russia pressed forward to capture Berlin, the British, American, and French armies advanced to cross the

Rhine. The Germans fought stubbornly, but they were outnumbered, and their industrial cities and communications had been largely destroyed by attacks from the air. The suicide of Hitler and Goebbels in the air raid shelter under the chancellery in Berlin was followed by unconditional surrender of the German armed forces. The end of the fighting in the greatest war she had experienced was, so far as Europe was concerned, celebrated on VE day, May 8, 1945. The Third Reich, which its rulers boasted would last a thousand years, had disappeared in twelve, and its

place as the strongest power on the Continent had been taken by Russia. A new era had begun.

For the history of Europe since the war, see Europe in N.V.; see also Council of Europe; Western Union.

G. P. Gooch

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## EUROPE, WESTERN: ITS LIBERATION

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*Under this heading is given a general picture of the Allied campaign in the West, June 1944, to May, 1945. For fuller accounts of parts of the campaign, see Belgium; France; Netherlands. See also Arnhem; Casualties; D-day; Mulberry Harbour; Pluto; Radar; Russo-German Campaigns, 1941-45, etc. The war as a whole is treated under Second Great War*

Having decided, as they did at an early stage, that Germany could not be defeated without a landing on the west coast of France, the Allied combined chiefs of staff found themselves faced by the stiffest problem they had to overcome: that of establishing a secure foothold upon a fortified continent. Later stages of the attack would be difficult, but this was the most difficult of all.

In Feb., 1944, the enemy had 53 divisions in the west under the supreme command of F.-M. von Rundstedt; by June 3, his forces in France and the Low Countries had been increased to 60 divisions—10 panzer and 50 infantry. Half that strength, if it could concentrate quickly, would have been more than enough to drive any landing force back into the sea. The secure foothold had to be established before that could happen. This called for very careful study of the speed with which the enemy could concentrate and of the means of delaying him, such as attacks on his communications and feints leading him to believe that another landing was about to follow.

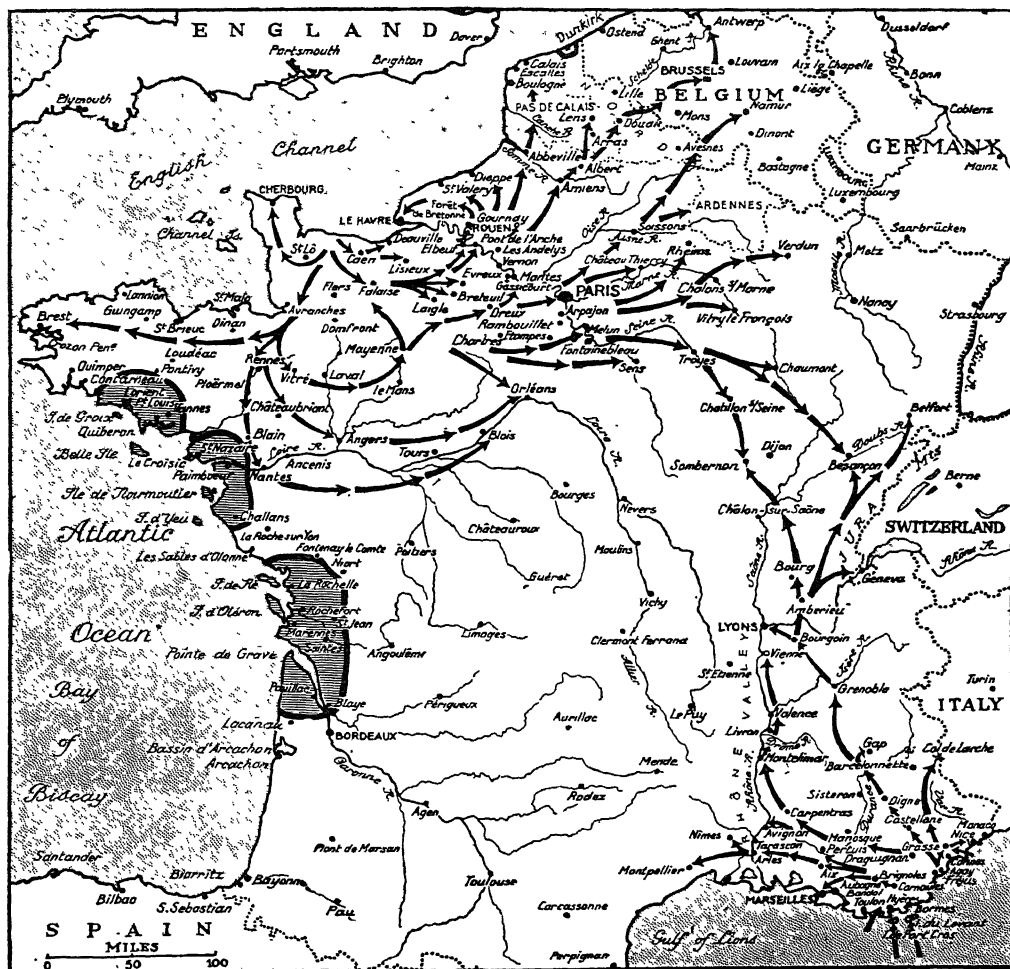
Allied preparations affected the whole life of Great Britain. Reserve stores for civilian consumption were accumulated because the bulk of the available shipping was temporarily taken over for the transport of the invading armies. The quartering, training, and movement of the vast forces involved was in itself a gigantic task. A simultaneous landing in the south of France,

and combined operations to secure Rangoon and liberate Burma in the only way it could have been done quickly, were ruthlessly set aside because there was a shortage of landing-craft. Operation "Overlord," as the landing in N. France was called, took priority because everything depended on its success.

A large amount of special equipment had been prepared to expedite the build-up and the breakthrough after the first landing. The outstanding examples were the material for the two artificial "Mulberry harbours" and for the petrol pipe-line laid under the sea (see Pluto). It also included special weapons known as petards for the destruction of concrete, flame-throwing tanks, mine-sweeping tanks, amphibious tanks and troop-carriers. Three airborne divisions were to be dropped, two at the base of the Cotentin peninsula to isolate Cherbourg, and the third to seize the crossings of the Caen canal to the E. of the Seine Bay.

The bay of the Seine was chosen for the landings because it came nearest to fulfilling the conditions sought. It afforded shelter and at the same time was less heavily defended than other areas with good beaches farther north, while it satisfied the requirements of the strategists and tacticians of the Allied air forces.

The assault was preceded by a heavy air offensive. This was directed against many targets, but chiefly synthetic oil plants and communications, including



Liberation of W. Europe. This map indicates the general lines of advance of the Allied armies after the landings in Normandy, June 6, 1944, and on the S. coast of France, Aug. 15, up to the date of junction of the two forces near Sombernon, Sept. 11. Shaded areas remained in enemy hands, the La Rochelle enclave until late April, 1945, the others until after the German surrender in May

rolling stock. A system of shuttle-bombing between the U.K. and the Mediterranean and later between Italy and Russia was developed. By the day of invasion, 74 bridges and tunnels leading to the battle area were impassable; and Germany's oil production had been reduced to about 30 p.c. of its normal capacity.

The invasion began on June 6, 1944. The airborne forces were dropped first. Then the great fleet of landing craft discharged their loads of troops and material on the beaches of Normandy. Air opposition was virtually nil, thanks largely to the Germans' lack of petrol. The original landing parties consisted of five divisions—two British, one Canadian, and

two American—apart from the airborne divisions and some special troops. The operations were conducted by the British commander, Gen. Sir B. L. Montgomery, to whom this responsibility had been delegated by the supreme allied commander, Gen. Dwight D. Eisenhower. There was some stiff fighting, but the measures taken to overcome the beach defences proved effective.

By June 12, all the lodgements had been linked together. A heavy storm caused delay and serious anxiety, but the supply of material and food put ashore was adequate, and Montgomery's plan quickly began to develop. It was, in brief, for the American forces to secure Cherbourg and make a great right-

wheel till they were facing eastward in the direction of Paris. Half-way through this wheel they were to detach a powerful force to overrun Brittany. Meanwhile the British forces were to attract to themselves the maximum possible German strength in armour and grind it down in unceasing battles.

Cherbourg fell to the U.S. 1st army on June 27. The Germans had not concentrated speedily enough to endanger the rapidly growing landing force, but they had brought no less than six armoured divisions against the British, which was just what Montgomery desired. But the greater hitting-power and lesser vulnerability of the German tanks caused

the British heavy loss at this stage, when the suitability of the country for defence was also to the enemy's advantage. The employment of heavy bombers in direct support on an enormous scale failed to break through the German anti-tank defences. Neither the attempt on Hitler's life on July 20 nor the drastic purge which followed it appeared to affect the fighting in France.

The Allied strength grew with remarkable speed during the battles close to the beaches. Towards the end of July there were established in France 18 U.S. divisions, five of them armoured, and in the British-Canadian army group 15 divisions, five of these, including a Polish division, also armoured. What was equally important was that, in addition to nourishing the heavy battles in progress, the administrative services of the Allies had built up great reserves of essentials—food, petrol, ammunition, bridging material—to support a long advance when the time came.

The American break-out started on July 25. It was brilliantly successful, and Avranches, the gateway to Brittany, was reached six days later. The U.S. 3rd army, which came into existence on Aug. 1 and was commanded by Gen. Patton, thrust west into Brittany, south to cut the neck of the Brittany peninsula, and then, leaving one corps only to reduce the Brittany ports, wheeled eastward. The Germans attempted to swing back their front, but the hinges were knocked away by the British, working from west to east as the American wheel gathered increasing speed.

#### Counter-Offensive Towards Avranches

In Brittany German opposition was negligible, except in the ports, and American armour pushed forward quickly towards Brest. The wheeling wing reached Laval, Mayenne, and Domfront. On Aug. 7 the Canadian 1st army resumed its attack towards the towns of Falaise and Argentan. On the same day the enemy launched his first full-scale counter-offensive, when four armoured divisions and elements of a fifth, with infantry support, struck westward against the Americans with the object of reaching the sea and cutting off all the American forces south of Avranches.

It was a bold stroke and it gained some initial success, but the Americans, well supported by the tactical air forces, then stood

firm. Montgomery had hoped to catch the enemy W. of the Seine; he now saw the chance of doing so, by a British-American junction between Argentan and Falaise. He ordered part of the American force to swing northwards. There was a tremendous fight before, on Aug. 19, the escape route from the pocket thus formed was closed, during which some proportion of the Germans farther west made their way out. But their losses from bombing and artillery fire were enormous.

While that battle went on, other U.S. divisions pressed towards the Seine. On Aug. 20 the head of the U.S. 3rd army reached the river and made a crossing near Mantes. British, Canadian, and U.S. forces overran the "Falaise pocket" and destroyed or captured all the troops remaining in it, and then raced eastward to the Seine.

#### German Losses in Men and Material

The enemy had suffered a terrible defeat. His losses, says Eisenhower, since the campaign began had been enormous. The equivalent of five Panzer and 20 infantry divisions had been destroyed; six other Panzer and 12 other infantry divisions had been severely mauled. By Aug. 25, the Germans had lost 400,000 killed, wounded, or captured, including 200,000 prisoners, 135,000 of whom were taken between July 25 and Aug. 25. They had left 20,000 vehicles, 1,200 tanks, and 2,000 guns on the battlefield. In the face of these results, it seems absurd to speak of disappointment. Yet the fact remains that if 20,000 vehicles were caught, 30,000 crossed the Seine, the greater part of them by the single bridge left standing. The air forces were powerful smashers of towns, including some, like Caen and Lisieux, among the most beautiful in Europe, but they were a relatively clumsy instrument. They could not create a block on the Seine. Had a real block been created on the Seine the war would have been nearly over.

To some, the events which immediately followed made it appear that this was already the case. On crossing the Seine the Allies poured E. and N.E. like a flood. On the right, Patton's 3rd army raced through Reims and Verdun, crossing the Moselle and establishing itself on the E. bank from Nancy to the neighbourhood of Metz by Sept. 11. The U.S. 1st army under Hodges captured Liège on Sept. 8 and reached the German frontier by the 11th. The

British 30th corps, as spearhead of the 21st army group, dashed away across the Somme, reaching Amiens on Aug. 31, Brussels on Sept. 3, and Antwerp on the 4th. Antwerp, one of the world's largest and best-equipped ports, was captured intact, but was of no value to the Allies while the Germans held the Schelde estuary.

During June and July some of the landing craft which had put the Allied armies ashore in Normandy made their way through the Strait of Gibraltar to Italy, to complete the fleet which on Aug. 15 landed on the S. coast of France the first troops of a new army, Gen. Patch's U.S. 7th, which included French troops. Landing W. of Cannes in good weather, the new expedition met but slight resistance. The "build-up" was far more rapid than in Normandy, later landings being unopposed.

While the French captured Toulon and Marseilles, the main body of Americans pressed up the Rhône. A small force also drove almost due N. from the landing places through the mountains to Grenoble, then wheeled into the Rhône valley to cut off the hostile forces fleeing up it. But this force was not strong enough for its task. The Germans had an armoured division, which broke through. The operation then became a pursuit. The Germans had lost heavily in prisoners, but their main body escaped and eventually joined the armies farther N. retreating towards the German frontier. The German forces in the S.W., harried by the French Forces of the Interior, fled north-eastward, but a considerable proportion of them were intercepted. By Sept. 11, when elements of the French 1st armoured division (serving with U.S. 7th army) made contact near Sombornon with the French 2nd armoured division (serving with the U.S. 3rd), the total of prisoners captured on both fronts was 395,000.

#### Eisenhower Assumes Personal Command

On Sept. 1 Eisenhower took over direct command of the Allied army groups in the N.—the 21st (or northern) group, consisting of the British 2nd and Canadian 1st armies under Montgomery, and the 12th (or central) group, consisting of the U.S. 1st, 3rd, and the recently formed 9th armies, under Bradley. On Sept. 15 the forces which had landed in the S. became the 6th (or southern) army group, under Gen. Devers,



and passed from Gen. Maitland Wilson's command to that of General Eisenhower. Operations were henceforth conducted in accordance with American doctrine, probing for weakness on a broad front, rather than with that associated with the name of Montgomery, concentration on a narrow front for an overwhelming thrust. It must always remain a question for debate whether if the second stage of the invasion had been conducted as it would have been by Montgomery the results would have been quicker. At all events, by the time the Allied armies reached the Maas and the Moselle, they were in a difficult situation from the point of view of supplies, which still had to be landed across the Normandy beaches, whence they had to be carried some 400 miles to reach the most advanced troops. In such circumstances, the wisest course would probably have been to concentrate before all else on opening the deep water port of Antwerp. It was, however, decided instead that Montgomery should make an attempt to jump the river barriers in front of him. His resources would not permit him to do both at once, particularly as the enemy was showing signs of recovering his balance.

Thus was initiated the battle of Arnhem, which began on Sept. 17. The essential feature was the dropping of a "carpet" of airborne troops, U.S. and British, across the successive waterways, the Maas, the Waal, and the Lower Rhine, on the axis of the main road from Eindhoven to Arnhem. Along the corridor thus formed the British 30th corps was to advance and

establish itself north of the Lower Rhine. The crossings of the Maas and Waal were secured, but that over the Lower Rhine at Arnhem had to be abandoned. (See Arnhem.) The advance was broken off, and the 21st army group set about clearing the West Schelde in order to bring the port of Antwerp into use.

The Germans had thrown garrisons tens of thousands strong into

the French ports in order to deny them to the Allies. Not all these garrisons made a strong resistance. Di ppe, which was to prove useful, was taken on Sept. 1, and Le Havre on Sept. 11. Brest held out until Sept. 19, by which time it was so badly damaged and so far from the fighting as to be of small value. The sweep up the Channe' coast, carried out by the Canadians, resulted not only in the capture of

LIBERATION OF WESTERN EUROPE: THE ALLIES' LINE UPON THE RHINE. MAP SHOWING POSITION OF THE ALLIED ARMIES JUST BEFORE THE FALL OF COLOGNE, MARCH 6, 1945. ON THE 500-M. FRONT WERE 21ST ARMY GROUP (CANADIAN 1ST, BRITISH 2ND, U.S. 9TH), F.-M. MONTGOMERY; 12TH (CENTRAL) GROUP (U.S. 1ST AND 3RD, GEN. BRADLEY; 6TH (SOUTHERN) GROUP (U.S. 7TH, FRENCH 1ST), GEN. DEVERS



valuable ports but also in the cessation of the bombardment of southern England by flying bombs (*g.v.*). On the capture of Boulogne (Sept. 23), a pipe-line was laid directly to it. Some of the ports, however, held out firmly. Dunkirk did not appear worth attacking, since its value was not likely to justify the losses involved, and its garrison surrendered only on May 11, 1945, after the general surrender. Bordeaux was liberated by the F.F.I. on Aug. 31, 1944, but the Germans held the Gironde estuary until, in April, 1945, the situation on the main front made it possible to send troops of the French 1st army to clear the position.

The opening of the W. Schelde, carried out by Canadian and British troops of the Canadian 1st army in the last week of Oct. and the first of Nov., was one of the most intricate and arduous operations undertaken in the whole course of the campaign. It involved a series of combined attacks by air, water, and land, and much use of amphibious equipment. The most difficult part of it was the capture of the island of Walcheren, most of which had been inundated by the breaching of the dykes by the R.A.F. (Oct. 3 and 7). Losses were heavy because it was seldom that the bombing put out of action the well-protected coast defences, and the Germans kept their guns in action up to the last.

#### Winter Campaign in Alsace

Antwerp was now open, and the railways were to a great extent restored, but this for the time being did not compensate for the bad weather, and for the opportunity to recover afforded to the enemy by the delay. During Nov. and early Dec. the troops laboured in heavy mud against the formidable Siegfried frontier defences. Losses were heavy, especially on the American front. Yet by Dec. 20, the French 1st army on the right had reached the Rhine, clearing Mulhouse on the 22nd; the French 2nd armoured division, still with the U.S. 7th army, entered Strasbourg on the 23rd; the Americans were pushing into the Saar, were beyond the Our (which forms the eastern frontier of Luxemburg), and were E. of Aachen; the British were holding the Maas.

The dispersion of Eisenhower's dispositions resulting from the dispersion of his attacks gave the enemy his chance for a riposte. Rundstedt, restored to supreme command after having been re-

lieved of it in Normandy, had gathered up a reserve, including some divisions from the eastern front. On Dec. 16 he struck on the most thinly held sector of the American front, between Echternach and Monschau. His object was to reach the Meuse, swing N. to take Liège, and penetrate as far as Brussels and Antwerp if all went well. He made use of three armies, two of them Panzer armies largely equipped with new Panther and Tiger tanks.

#### Battle of the Ardennes

The enemy smashed all resistance in his path and thrust deep into the Ardennes, creating a separation of left and right in Bradley's command which led to the placing temporarily under Montgomery of the U.S. 1st and 9th armies. The enemy achieved a maximum advance of over 50 m., but not at the old German speed. He was foiled by the manner in which the Allies covered and contained the flanks of the thrust, by the fine weather after Christmas which gave their air forces full scope, by the dogged resistance of the American troops, and in particular by the defence of the road junction of Bastogne, by the U.S. 101st airborne division, after it had been surrounded. When the Allies struck back he began to pull out again. This he did deliberately, and his rearguards fought so tenaciously that, though large numbers of prisoners were taken, he was never in any risk of being cut off. The denuding of the front in the Palatinate in order to reinforce the southern flank in the Ardennes enabled him to recover more ground here even while his main force was in full retreat, but this was not of the first importance. The battle of the Ardennes was substantially concluded by Jan. 16, 1945, and all remaining losses were soon recovered when the Allies had regrouped. This was the last German counterstroke. It cost the enemy 220,000 casualties and immense losses in tanks, guns, vehicles, aeroplanes, and achieved nothing decisive. It led to Rundstedt's replacement by F.-M. Kesselring—presumably in the hope that he would repeat the defensive success he had achieved in Italy.

Rundstedt had, however, delayed the Allies at least six weeks. They now used their recovery of the initiative to press on to the Rhine. Early in Feb. the Franco-American forces closed upon the river from the Swiss frontier to

Strasbourg. On March 15, Patton's 3rd army also advanced on the Rhine, crossing the Moselle just short of the confluence at Coblenz. On the same day, the U.S. 7th army struck northward between Saarbrücken and the Rhine. The big German pocket between the Rhine and the Moselle at once collapsed.

Farther north, the U.S. 1st army reached the Rhine at Cologne, which it captured on March 7. On that same day one of its columns, closing to the Rhine farther south, found the Ludendorff railway bridge at Remagen intact, and succeeded in crossing. This was an entirely unexpected gift, not allowed for in Eisenhower's plans; but these were immediately adapted to the new situation.

#### Struggle for the Rhine

Montgomery's army group (of which the U.S. 9th army still formed part) experienced the grimmest fighting in all this Rhineland operation. Its orders were to line up on the Rhine from Düsseldorf northwards. The British 30th corps, under the command of the Canadian 1st army, had to clear the Reichswald, between the Maas and the Rhine, with the aid of the U.S. 9th. There followed one of the fiercest struggles fought in the whole course of the war in the depths of the great water-logged forest. The enemy cut the Roer dams before abandoning them, and the resulting floods delayed the 9th army's northward thrust; but the two armies linked on March 3. Except for a tenaciously held enemy bridgehead at Wesel, eliminated only a week later, the 21st army group had fulfilled its task.

"The whole of the Allied campaign west of the Rhine had gone according to plan to an extraordinary degree, and my fullest hopes were realized," says Gen. Eisenhower in his report. Chief of those hopes had been that the Germans would fight the decisive battle W. of the Rhine, to compel which the possibility of destroying the 31 Rhine bridges behind the enemy was considered, but abandoned as involving too great a diversion from the existing strategic air effort. The enemy had withdrawn; but he had suffered very heavy losses. He had not stood to the end, and had, with the skill which he had not yet lost, transferred a considerable proportion of his troops and material to the E. bank. Yet the war was almost as good as over. The dis-

person of German war industries, a wise step when it was undertaken, had the disadvantage now, when bombs were raining upon his communications, that the enemy was finding it impossible to bring his equipment and warlike stores to the scene of action.

After a tremendous air and artillery bombardment, the passage of the Rhine by the British 2nd army began on the night of March 23. Next morning two airborne divisions, one British and one American, were landed beyond the Rhine north of Wesel, within range of supporting fire from the west bank, and after the heads of the columns of the land forces were already over the river. The U.S. 9th army also effected a crossing early on the 24th, against moderate resistance. The U.S. 1st army undertook an offensive south from its bridgehead at Remagen. The U.S. 3rd army got over on either side of Mainz.

#### Inequality of Opposing Forces

The opposing forces were now strikingly unequal in power and numbers. On the Allied side stood approximately 83 divisions, including the airborne—60 U.S., 16 British, and seven French. All but a few American divisions, held in reserve, were ready to march into Germany or the Netherlands. On the German side was a maximum of 56 divisions in being, many of them seriously under strength; the skeletons of several others; and a mass of hastily enrolled "home guards." In armament, the contrast was even greater. In the air the Allied advantage was overwhelming; in fact the last occasion when the Luftwaffe was seen in the air in strength was at the opening of the counter-offensive into the Ardennes. Nor was there any further heavy fighting by the standard of what had gone before.

The Allied bridging and engineering work in general was superlative, so that powerful striking forces were soon over the Rhine. The U.S. 1st and 9th armies enveloped the Ruhr area, making contact near Lippstadt on April 1; they trapped the whole of one German army group and two corps of another—a total of 21 divisions. Then deep thrusts, not seriously opposed, were made into the heart of Germany: the French towards the Swiss frontier, the U.S. 7th army towards Munich and the Brenner, the U.S. 3rd on Erfurt and then away down to the Danube below Regensburg and over the Czech-Slovak frontier,

the U.S. 1st on Leipzig, the U.S. 9th on Brunswick, and the British 2nd on Bremen and Hamburg. The Canadian 1st army swung northward and by the middle of April, after heavy fighting, reached the sea north of Groningen, liberating the Netherlands east of the Zuyder Zee, but leaving strong German forces isolated in "Fortress Holland"—the provinces of N. and S. Holland.

No demarcation line was set in advance for the meeting of the Western Allies and the Russians, local commanders receiving orders to arrange a temporary boundary when contact was imminent. When the time came, this boundary was fixed in the central sector along the Elbe and Mulde rivers. On April 25 patrols of the U.S. 1st army established contact with Russian troops on the Elbe at Torgau.

Pushing along the Danube, the U.S. 3rd army advanced into Austria, entering Linz on May 5, while the 7th took Innsbruck on May 3 and made contact with the U.S. 5th army (see Italy, Campaign in) at Vipiteno beyond the Brenner. In the north, the British 2nd army, reinforced by a U.S. airborne corps, crossed the Elbe on April 29, outflanked Hamburg, and on May 2 reached the Baltic at Lübeck (cutting off the peninsula of Denmark), and made a junction with the Russians at Wismar. On May 4 a German delegation which came to Montgomery's headquarters signed an instrument of unconditional surrender of all naval, land, and air forces opposite the 21st army group. The final surrender of all the forces of the Reich was made to General Eisenhower at Reims on May 7. The military, political, and economic system of Germany had completely collapsed.

#### Victory Never in Doubt

From first to last, except for a brief period at the height of the counter-offensive in the Ardennes, the Allies had never lost the initiative. They had gone forward remorselessly, and victory had never been seriously in doubt. Their casualties had been heavy, those for the land forces numbering in dead, wounded, and missing 766,967 (American 514,534, British and Canadian 184,512, French 61,247, the balance being made up of Poles, Czechs, Belgians, and Dutch); but these casualties were far below those inflicted upon the enemy. *Consult* Report by the Supreme Commander to the Combined Chiefs of Staff on the Opera-

tions in Europe of the Allied Expeditionary Force, 1946; Report by the Supreme Commander, Mediterranean, to the Combined Chiefs of Staff on the Operations in Southern France 1946; Dispatch to the Secretary of State for War on Operations in N.W. Europe, June 6, 1944–May 5, 1945, by F.M. the Viscount Montgomery, 1946.

**Europeanism.** Term used to describe advocacy of a united Europe. This idea is rooted in experience—e.g. the Roman Empire, with its civilizing and materially beneficent influence; Charlemagne's "universal monarchy"; the unity created by the R.C. church. The breaking up of each of these unities, partial as they were, was followed by the strife, and economic and cultural destruction, which have been characteristic of Europe since the later middle ages.

On the basis that the peoples of Europe, all deriving their thought and ways of life from Greco-Roman and, later, Christian sources, have enough in common to form a political unit, George Podiebrad, king of Bohemia (1420–1471), advocated a general European federation, based on a permanent alliance of rulers, as a protection against the Turks. A similar scheme, devised by Maximilien, duc de Sully (1559–1641), friend and first minister of Henry IV of France, in his *Grand Design*, was elaborated and given a legal framework by Hugo Grotius (1583–1645), the great Dutch statesman and humanist, founder of international law. William Penn, in 1693, sketched a somewhat less definite organization of European states as a means for securing permanent peace. Charles Irénée Castel, Abbé de St. Pierre (1658–1743), based his *Projet de Paix Perpétuelle* (1713) on Sully's project. The Koenigsberg philosopher Immanuel Kant (1724–1804) advocated, in his short and precise treatise *Towards Eternal Peace* (1795), a parliamentary federation of Europe. Napoleon interpreted the idea in his own way as a Europe dominated by himself. ♡

Le comte de Saint-Simon (1760–1825), with his friend Thierry, drew up a scheme for a European federation under a king and parliament on the British pattern, and with a unified currency, in 1814; and a German author, A. Mallinckrodt, also at the time of the Vienna Congress, 1815, introduced into the idea the economic motive, which in some shape has remained a fundamental part of its subse-

quent formulations, by suggesting free trade, unified currency and weights and measures, and free movement within a federated Europe. Frenchmen like Léon Faucher (1837) and G. de Molinari (1879), and a German, R. von Kaufmann (1880) advocated customs unions embracing, in the first place, several economically complementary powers; Comte P. de Leusse saw in a Franco-German customs union the solution of Europe's main problem (1888). A committee was set up in 1908, under the French lawyer and economist Lucien Coquet and the German Dr. Borgius, to develop this idea.

Count Richard Coudenhove-Kalergi (*q.v.*) with the backing of outstanding Europeans made a new approach to the problem in his *PanEuropa* (1923). An international group of economists and statesmen, formed by Edgar Stern-Rubarth with the help of the Hungarian E. Bleier and the Frenchman L. Coquet, and under Briand's chairmanship, worked for a European customs union. The Oslo Convention (*q.v.*), 1937, was an attempt to lay the foundations of such a union. The rise of Nazi-Fascist systems of government, and the outbreak of war stopped practical extension of the idea, but not of the idea itself, which, during and after the Second Great War, found expression in *e.g.* Western Union (*q.v.*).

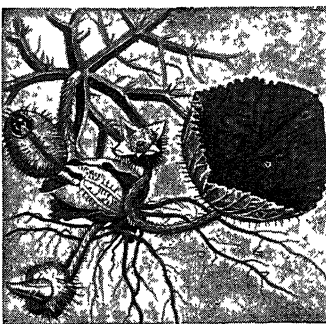
**European Recovery Programme.** Internationally concerted plan and action to restore economic stability to post-war Europe, based on financial and material assistance from the U.S.A. ("Marshall aid") and on economic co-operation among the nations of Western Europe that remained outside Russian influence. For full details see the N.V. pages at the end of this Encyclopedia.

**Europium.** Chemical element, one of the terbium family of rare earths, moderately soluble in a saturated solution of potassium sulphate. Demarçay isolated the nitrate by fractional crystallisation in 1896, Crookes having noticed a red band in the phosphorescent spectrum of a fractionated yttria earth. In 1939 Trombe separated 98 p.c. pure europium by a process of distillation in argon under pressure from the electrolytically prepared alloy with cadmium. This metal has the same hardness as neodymium and a melting point between 1,100–1,200° C. The atomic weight as determined by the mass spectro-

graph is 151.89 and by the analysis of pure europous chloride 151.96. The atomic number is 63. Europium has a body centred cubic structure. Europia,  $\text{Eu}_2\text{O}_3$ , is a pale pink powder. It forms a hydroxide, chloride, dichloride, oxychloride, sulphate, carbonate, and nitrate. Traces may be separated from gadolinium by the action of dilute sodium amalgam under acid conditions.

**Eurotas.** River of ancient Laconia, Greece, now known as Iri. It discharges into the Gulf of Laconia after a course of 60 m. Sparta stood on its banks.

**Euryale ferox.** Aquatic perennial herb of the family Nymphaeaceae. It is a native of the E.



**Euryale ferox.** Leaves and flowers of this East Indies aquatic plant

Indies. Its circular floating leaves are 1 ft. to 4 ft. in diameter, the rich purple underside, like the sepals of the purple flower, being protected by numerous spines. The fruit is a round berry containing numerous farinaceous seeds, which are eaten after being baked in sand. The Chinese cultivate the plant for these seeds.

In Greek mythology Euryale is the name of one of the Gorgons (*q.v.*). *Pron.* U-rye-alee.

**Eurydice.** In Greek mythology, wife of the poet Orpheus. When she died Orpheus went down into Hades, and by the power of his lyre induced Pluto, ruler of the underworld, to restore his wife to him, on condition that Orpheus did not look behind until he reached the earth again. In his eagerness to see if his wife were following, he forgot the condition, and Eurydice was lost to him for ever. See Orpheus. *Pron.* U-rid-di-see.

**Eurymedon.** Ancient name of the Kopru Su, a river of Pamphylia, Asia Minor. It flowed into the Mediterranean, W. of the Taurus Mts., and at its mouth the Athenians under Cimon (*q.v.*) defeated the Persians 466 B.C.

**Eurypterida** (Gr. *eury*s, broad; *pteron*, wing). Extinct scorpion-like animals of the class Arachnida (*q.v.*). The body is rather flat, sometimes as much as 6 ft. in length, covered by a thin horny covering (carapace) and ornamented by fine, scale-like markings. The head is semicircular, consisting of six segments fused together, and six pairs of appendages are attached to the head-shield, the last pair being adapted as swimming paddles. The abdominal portion is long, of 12 segments, the first six bearing plate-like appendages with leaf-like gills. The last segment is a tail-plate, sometimes produced into a long spine. The upper surface of the head-shield has two eye-spots near the centre, and a large pair of faceted eyes near the margin. Eurypterids originally inhabited the sea, but became adapted to brackish and possibly to freshwater conditions. Fossils are found in Silurian, Devonian, and Carboniferous strata.

**Eusebius** (c. 264–340). Church historian. Often called Eusebius Pamphili, he was probably a native of Palestine and spent his youth at Caesarea. After the martyrdom under Diocletian of his teacher Pamphilus, he took refuge in Egypt, and about 313 was appointed bishop of Caesarea by the emperor Constantine the Great. At the council of Nicaea, 325, though himself orthodox, he showed leanings towards the Arian party. His historical writings especially *Præparatio Evangelica* (selections trans. H. Street, 1842), *Demonstratio Evangelica*, and *Historia Ecclesiastica*, entitle him to be called the father of ecclesiastical history. The *Historia* has been translated into English by A. C. McGiffert, 1890.

**Eustachian Tube.** Tube leading from the upper part of the pharynx to the tympanic cavity of the ear. Its function is to maintain equal atmospheric pressure on both sides of the ear-drum. It is ordinarily closed, but is opened by each act of swallowing. Blocking of the tube, as in catarrhal conditions or from the growth of adenoids, leads to bulging of the membrane and partial deafness. If the passage does not open when the catarrh disappears, the obstruction can usually be removed by inhaling steam or by blowing air into the tube. If it is due to adenoids, the growth must be removed. The tube is named after Bartolommeo Eustachio (d. 1574), Italian anatomist. See Ear.

**Eustachian Valve.** The valve guarding, on the right, the opening of the great veins into the auricle of the heart. It is derived from the remains of the right sino-auricular valve of the generalised vertebrate form. It assists in preventing the reflux of blood when the right auricle contracts.

**Eustatic Movements.** In geology and geography, world-wide changes in sea-level, in contradistinction to apparent changes resulting from movements of the land. Because land movements may be in progress at the same time as eustatic movements it is often difficult to differentiate between the two. The removal of water from the oceans to form the great ice-sheets of the Pleistocene period caused a lowering of sea-level of 300 ft. or more. As the ice melted the water returned to the oceans and the level was raised once more. Such eustatic movements have influenced development of coral islands, and were probably responsible for the submarine canyons in the continental slopes. *See* Earth Movement.

**Euston Road.** London thoroughfare. With Marylebone Road on the W. and Pentonville Road on the E., it forms part of the New Road laid out in 1754-56 to connect Paddington and Islington, and extends from Great Portland Street to King's Cross. In Euston Square is the entrance to Euston railway terminus. St. Pancras, another great terminus, is in Euston Road, as is also King's Cross terminus. The Metropolitan and District lines of London Transport have a station at King's Cross, at the Gower Street corner (Euston Square), and at Great Portland Street. The Northern Line goes through Warren Street (at the Tottenham Court Road corner), Euston, and King's Cross. The Piccadilly Line has a station at King's Cross. In Euston Road are the (new) church of S. Pancras, built 1819-22, a modified copy of the Erechtheum at Athens; Unity House, headquarters of the National Union of Railwaymen; and Friends House, headquarters of the Society of Friends.

**Eutaw Springs.** Locality and river of S. Carolina, U.S.A.; the latter being a tributary of the Santee river. Near here on Sept. 8, 1781, was fought an indecisive battle in the War of Independence. The American force under General Greene gained an early success over the British under General Stuart, but the latter successfully withstood a second onslaught.

**Eutectic** (Gr. *eu*, well; *tēkein*, to melt.) A condition of chemical equilibrium. The lowering of the freezing point of water by the addition of common salt was investigated by Raoult. Guthrie in 1878 discovered that at a certain temperature,  $-22^{\circ}$  C., and concentration, 23.5 p.c. of salt, the solution solidified completely as one mass. He called this type of mixture a eutectic and, for any two substances, the temperature and concentration remain constant. The term is used widely in connexion with the freezing and melting of alloys.

If two metals are completely soluble in each other in the liquid state, but either partly or wholly insoluble in the solid state, they may form a eutectic. Examples are lead and antimony, lead-silver, lead-tin, copper-silver. The phenomenon is best recognized by an examination of the constitution diagrams (*q.v.*) of such systems. Thus, if a melt of 50 p.c. each of lead and antimony is cooled slowly, seed crystals of antimony form in the melt. This leaves the latter poorer in antimony, but further cooling causes the seed crystals to grow, reducing the antimony content of the liquid still further. Finally a composition and temperature are reached at which both lead and antimony solidify together; this is the eutectic point, and the alloy is known as the eutectic, in this example containing 12.5 p.c. of antimony. Similarly an alloy containing only 5 p.c. of antimony deposits crystals of lead from the melt on cooling; these grow until the melt again reaches the eutectic composition. An alloy containing exactly 12.5 p.c. of antimony will solidify as a mixture of fine crystals at  $247^{\circ}$  C., considerably below the melting points of both lead and antimony. This lowering of the melting point is characteristic of the eutectic.

Alloys which form an unbroken sequence of solid solutions show no eutectic, but often metals will alloy as solid solutions over part of the range of composition, while between the limits of these ranges they will form eutectics. The same principles apply for alloys of three or more metals. Plumber's solder, containing 2 parts of lead to 1 part of tin, is a eutectic alloy, and its low temperature of solidification, below that of lead, makes it suitable for wiping joints.

**Eutectoid.** Essentially similar to a eutectic (*v.s.*), a eutectoid, however, is formed entirely in the solid state. Just as a molten

solution of two metals may break up into two types of crystal when it becomes solid, so a solid solution may break up into two different, but closely admixed, constituents. This is of particular importance in aluminium bronze and steel: a eutectoid steel contains 0.87 p.c. of carbon in iron, and the eutectoid is known as pearlite, as it resembles mother-of-pearl when viewed under the microscope. Quenching restricts this change, and causes hardening due to the strained state of the crystal lattice.

**Euterpē** (Gr., the well-pleasing). In Greek mythology, one of the nine muses. Her province was lyric poetry. *See* Muses.

**Euthanasia** (Gr. *eu*, well; *thanatos*, death). Easy or comfortable death; in medical language, the employment of means calculated to render the death of those suffering from painful and incurable diseases as painless as possible. Induced euthanasia was advocated by Plato, and was common under the Roman emperors, many of Pliny's friends being recorded as submitting to it. In the island of Ceos (Zea), in the Cyclades, euthanasia was enjoined on citizens over 60. In old Marseilles it is said that the authorities were memorialised in cases of serious illness, or even of dire misfortune, as to the advisability of euthanasia. In More's ideal state, Utopia, euthanasia was practised.

**Eutheria** (Gr. *eu*, well; *thērion*, beast) OR PLACENTALS. One of the three sub-classes of Mammalia, the other two being the prototheria or monotremes and the metatheria or marsupials. Of these the prototheria are oviparous; the metatheria bring forth their young prematurely and nurture them in a pouch; and the eutheria produce more or less perfectly developed young, which during gestation are vitally united to the mother by a placenta.

**Eutropius.** Roman historian of the 4th century A.D. Secretary to the emperor Julian, he was the author of *Breviarium ab Urbe Condita*, a short history of Rome from its foundation to 364. The work has little historical value but the simplicity of its style has made it a favourite text-book for beginners in Latin.

**Eutyches** (*Fl.* 5th century, A.D.). Founder of the Eutychian heresy. Superior of a monastery at Constantinople, he taught that the human nature of Christ was absorbed in the divine, and there-

fore non-existent, even His body not being truly human. For this he was condemned by a synod at Constantinople in 448, restored by the "Robber" council of Ephesus in 449, but finally condemned by the council of Chalcedon in 451, and afterwards banished. *Pron. U-ty-keez.*

**Euxine.** Ancient name of the Black Sea, the Pontus Euxinus, or hospitable sea. It was originally called Axenos, inhospitable, from the prevalent storms, and the hatred of strangers shown by the dwellers on the coasts. The name was probably changed when increasing commerce and the establishment of Greek colonies made it better known. *See* Black Sea.

**Evacuation** (Lat. *evacuatio*, I empty). Military term for the act of withdrawing from a position. It was also applied to the movement of the civil population from areas threatened with aerial bombardment or invasion during the Second Great War. In Great Britain, under plans already prepared, evacuation from the London area began on Sept. 1, 1939. In four days some 370,000 children accompanied by their teachers, and nearly 280,000 others with their mothers, left the metropolis. Altogether 1,270,000 people went from 81 evacuation areas to 1,100 reception areas, chiefly in Lancs, Yorks, Derbyshire, Wales. This number rose to 1,341,000 in February, 1941. Under the government scheme for the evacuation of children between the ages of five and 16 to the British dominions, some 2,650 had reached their temporary homes in other countries before the sinking of the liner City of Benares on Sept. 17, 1940, when 77 children bound for Canada perished, caused the government to suspend the scheme.

Many government departments, banks, business houses, and sections of the B.B.C. moved out of London; and thousands left the threatened areas privately. Abroad 15,000 women and children were moved from Gibraltar in 1940, some 11,000 to the U.K.

Many "evacuees" returned to London during 1942-44; but the flying bombs caused a second mass evacuation, some 280,000 leaving London, July 2-Aug. 8, 1944.

Govt. sponsored return to evacuation areas in the N., W., Midlands, and S.W. began in Sept., 1944; to E. Anglia in March, and to London, Hull, and Grimsby in May, 1945. By July, 1945, only 76,000 remained in reception areas; by April, 1948, when the last count

was taken, 3,567. The scheme ended July 5, 1948, when the home secretary, under the Children Act, became responsible for unaccompanied children, and old people in hostels and the physically handicapped came under the provisions of the National Assistance Act. Allied air attack on W. Germany and Berlin led to the evacuation of millions to Silesia, Poland, Czecho-Slovakia, and Austria.

**Evagoras** (d. 374 B.C.). King of Salamis in Cyprus. Seizing the throne c. 410, he developed the naval power of his kingdom. He was on friendly terms with the Athenians, especially with the Athenian admiral Conon (*q.v.*), and it was due to him that Conon was helped by the Persian fleet at Cnidus (*q.v.*) in 394. Subsequently, in the war between Evagoras and the Persians, the Athenian fleet came to his aid. The war with Persia dragged on for several years, and was eventually ended by a settlement which guaranteed to Evagoras his kingdom. He was murdered by a courtier.

**Evagrius** (c. 536-600). Byzantine eccles. historian. Born at Epiphania, in Coele-Syria, he flourished during the reigns of the emperors Tiberius and Maurice. At first he studied law at Antioch, whence his surname Scholasticus (advocate). One of the continuators of Eusebius, his history covers the period from the council of Ephesus, 431, down to 593. It throws light chiefly on the religious controversies of the period.

**Evander.** A legendary Italian hero. Some time before the Trojan war he was said to have conducted a band of colonists from Pallantium in Arcadia to Italy, where he founded a settlement on the Palatine hill. Writing and other arts and the institution of the Lupercalia in honour of the Arcadian god, Pan, were ascribed to him. Evander, who figures in the Aeneid of Virgil, is really the Italian Faunus (the favourable one), to whom the Greek Pan also corresponds, and the story of the Arcadian colony, like much in Roman mythology and legend, is due to Greek influence.

**Evangelical** (Gr. *evangelikos*, of the Gospel). Term applied to the religious revival within and without the Anglican Church in the 18th century. The movement was started by John and Charles Wesley and George Whitefield. They had all been members of the Holy Club at Oxford (1729-35). In 1738 John Wesley experienced conversion at the Moravian chapel

in Aldersgate, and shortly afterwards, following Whitefield's example, he began open air preaching at Bristol, at Moorfields, and Kennington, and up and down the country for the rest of his life. His followers broke away from the Established Church after Wesley's death, and formed the Methodist or Wesleyan Churches. (*See* Methodism.)

Other leaders in the 18th century were Romaine (S. Dunstan's, Fleet St.); Henry Venn (Huddersfield); Grimshaw (Haworth); Fletcher (Madeley); Walker (Truro); Berridge (Everton, Beds); Newton (S. Mary Woolnoth, Lombard St.); Scott (Olney); John Thornton, the banker; and Cowper the poet, who with Charles Wesley, Toplady, Cecil, and others created modern hymnology. In the 19th century the leading men were Charles Simeon, who carried on work in Cambridge already begun by Isaac Milner; Dale (S. Bride's, Fleet St.); Daniel Wilson (Islington); McNeile (Liverpool); Stowell (Manchester); and especially John Venn, and the six laymen Henry Thornton, William Wilberforce, Charles Grant, James Stephen, Zachary Macaulay, and Lord Teignmouth, who formed the Clapham sect.

The movement promoted Sunday Schools (Hannah More), benevolent societies, a revival of parochial life, the training of candidates for the ministry, the distribution of the Bible, pastoral work in big towns, missionary work abroad, the abolition of the slave trade (Wilberforce and Buxton) and the passing of the first Factory Acts (Lord Shaftesbury). These different activities were mainly carried on by big societies founded at the turn of the 18th and 19th centuries—Church Missionary, Bible, and Religious Tract Societies. Later came the London Jews, Church Pastoral Aid Society, Church Association, Y.M.C.A., Y.W.C.A., etc.

The Evangelicals emphasised original sin, the efficacy of the Atonement, the need of personal conversion, justification by faith, and veneration for the letter of the Scriptures. What is known today as the Low Church party in the Church of England (to be distinguished from the Low Church party of the period preceding the Evangelical revivals) is usually called evangelical. Its leaders meet annually at the Keswick Convention and the Oxford and Islington Conferences. The term evangelical is applied to the United Lutheran

and Reformed Church in Germany and to the Protestants of France. It forms part of the title of the World's Evangelical Alliance (*q.v.*) and of similar organizations in America. In the 20th century the Anglican Evangelical Group Movement was founded and led by Canon Storr of Westminster, to promote more liberal and scholarly teaching of the earlier doctrines of the movement. *Consult* The Evangelical Revival in the 18th Century, J. H. Overton, 1909; History of the Evangelical Party in the Church of England, G. R. Balleine, 1929.

**Evangelical Union** OR MORISONIANS. Scottish Presbyterian body. It was founded by the Rev. James Morison of Kilmarnock and other seceders from the United Secession Church in 1843. Soon afterwards they were joined by ministers expelled from the Congregational Union. They rejected the doctrine of predestination, and maintained universal redemption and the freedom of the will. The churches were independent and free to adopt Presbyterian or Congregational forms of government. All ministers had to be total abstiners. The bulk of the congregations joined the Congregational Union (of Scotland) in 1896.

**Evangeline.** Narrative idyllic poem by H. W. Longfellow. First published in 1847, the story is a romantic account of the deportations in 1755 of the French Acadians from Acadie (Nova Scotia), owing to their lack of sympathy with their British and Protestant rulers. It is a tender, tragic romance, beautifully told, and one of the most successful instances in English of the sustained use of hexameters. The poem is named from the heroine, who was first to have been Gabrielle, a name later adapted as Gabriel for the hero.

**Evangelist** (Gr. *evangelistēs*, proclaimer of glad tidings). Originally one chosen by the apostles to preach the Gospel where it was unknown. Theodoret first restricted the name to travelling preachers; Oecumenius first applied it to the authors of the four Gospels; today it is also used for missionaries and revivalist preachers. (*Consult* Eph. 4; Acts 8 and 21; 2 Tim. 4.) The four living creatures referred to in Ezek. 1 and 10, and Rev. 4, were regarded by Jerome as symbols of the four evangelists—the man, Matthew; the lion, Mark; the ox, Luke; the eagle, John. Irenaeus assigned the lion to John and the eagle to Mark; Augustine and Bede, the lion to

Matthew and the man to Mark. Evangelist is the character who first shows the way to Christian in Bunyan's *Pilgrim's Progress*. See *Apostle*; *Gospel*; *Preaching*.

**Evans, SIR ARTHUR JOHN** (1851–1941). A British archaeologist. Eldest son of Sir John Evans (*q.v.*), he was born July 8, 1851, at Hemel Hempstead, and went from Harrow to Brasenose College, and Göttingen. From 1873 he engaged in archaeological exploration in Finland, Lapland, and the Balkans. Keeper of the Ashmolean Museum at Oxford from 1884, he raised it before his retirement in 1908 to the status of a national institution. His first visit to Crete, 1893, yielded the discovery of a pre-Phoenician script, which led to fresh study of Mycenaean culture. Even more valuable was Evans's excavation, 1900–08, of the Minoan palace at Knossos, the discoveries attracting attention from scholars and antiquarians all over the world. Professor of prehistoric archaeology at Oxford, 1910, and of many learned societies and institutions, Evans



Sir Arthur Evans,  
British archaeologist  
Lafayette

made his house at Boar's Hill a centre for students. He published the results of his excavations, notably *The Palace at Minos*, 2 vols., 1921 and 1928. He married Margaret (d. 1893), daughter of the historian Edward Augustus Freeman; he was knighted 1911; and died July 11, 1941.

**Evans, CARADOC** (d. 1945). A Welsh novelist and journalist. The son of a Carmarthen auctioneer, he was born at Pantycroy, Llandyssul, and left school at 13 to be apprenticed to a linen draper. During the First Great War his vituperative references to the Welsh in *My People*, 1915, and *Capel Sion*, 1916, incensed his fellow countrymen. A copy of his play, *Taffy*, 1923, was publicly burned in a refuse destructor at Barry. A novel, *Morgan Bible*, 1943, was followed posthumously by *Mother's Marvel*, 1949. Evans was editor of *T.P.'s* and *Cassell's Weekly* in 1925. He died at Aberystwyth, Jan. 11, 1945. His second wife, Countess Barcynska (Oliver Sandys), wrote his biography in 1946.

**Evans, DAME EDITH** (b. 1888). British actress. She was born in

London, Feb. 8, 1888, and made her first professional appearance on the stage as Cressida at the



Dame Edith Evans,  
British actress

King's Hall, Covent Garden, 1912. After touring with Ellen Terry in Shakespearean repertory, she appeared in *My Lady's Dress* in 1920, and the following years scored a great personal success as Lady Utterword in *Heartbreak House*. This was one of many parts she created; others were those of *The Serpent* and *The She-Ancient in Back to Methuselah* (*q.v.*); Florence Nightingale in *The Lady with a Lamp*; *Oriothia in The Apple Cart*; *Irela in Evensong*; *Gweny in The Late Christopher Bean*; *Agatha Payne in The Old Ladies*; *Sanchia Carson in Robert's Wife*. Distinguished performances which must also be accounted *troups de force* included those as the Nurse in *Romeo and Juliet*; *Rosalind in As You Like It*; *Millamant in The Way of the World*; *Lady Pitts in Bride's Daphne Laureola*. Her film début was in the *Queen of Spades*, 1949. A versatile as well as a brilliant actress, Dame Edith (or. 1945) displayed a mastery of technique and a genius for artificial comedy.

**Evans, EDWARD RATCLIFFE** GARTH RUSSELL (b. 1881). British sailor. Known as Evans of the Broke, he was raised to the peerage Oct., 1945, as Baron Mountevans (*q.v.*) of Chelsea.

**Evans, SIR GEORGE DE LACY** (1787–1870). British soldier. Born at Moig, co. Limerick, he entered the Indian army in 1806, and in 1812 he joined the 3rd Dragoons in the Peninsula. In 1835–37 he commanded the legion recruited in England to assist Queen Isabella of Spain against the Carlists. Though ill-equipped and neglected by the Spanish government, it fought well. Evans was knighted 1839, promoted general 1861, and died Jan. 9, 1870.

**Evans, SIR JOHN** (1823–1908). British archaeologist and numismatist. Born at Britwell Court, Bucks, Nov. 17, 1823, in 1840 he entered his uncle's paper mills at Hemel Hempstead. Admitted a fellow 1861, he was treasurer of the Royal Society, 1878–98. He was president of the Geological Society, 1874–76; the Numismatic Society, 1874–1908; the Society of An-



tiquaries, 1885-92; and the Anthropological Institute, 1877-79. He wrote standard works on Coins of the Ancient Britons, 1864; Ancient Stone Implements, 1872; Ancient Bronze Implements, 1881. Knighted 1892, he died May 31, 1908. His collection of 1,700 coins was presented to the British Museum by his son, Sir Arthur (*q.v.*).

**Evans, MARIAN OR MARY ANN** (1819-80). Maiden name of the British novelist who wrote as George Eliot (*q.v.*).

**Evans, OLIVER** (1755-1819). American inventor. Born at Newport, Delaware, he entered his brother's milling business, and invented and fitted up various appliances for economising time and labour. The machinery was worked by water power, and revolutionised the grinding of corn. Americans claim that Evans designed the first steam engine on the high-pressure principle, and it is agreed that his plans, sent to England, were seen by Trevithick. Although never so successful as Watt, he was one of the pioneers of steam locomotion, and ranks as one of the most ingenious mechanics that America has produced. He died at New York, April 16, 1819.

**Evaston.** City of Illinois, U.S.A., in Cook co. It stands on Lake Michigan, 13 m. N. of Chicago, of which it is a residential suburb, and is served by rlys. The seat of North Western university, it was settled in 1835, incorporated 1863, and chartered as a city 1892. It makes glass products, dairy equipment, and paint; and processes fruit and vegetable juices. Pop. 65 389.

**Evansville.** City of Indiana, U.S.A., the co. seat of Vanderburgh co. On the Ohio river, 185 m. S.W. of Indianapolis; it is served by rlys. and an airport. A port of entry, it trades in coal, flour, and tobacco, and has cotton, woollen, and flour mills, meat packing plants, stockyards, foundries, machinery works, and cigar, glass, and leather factories. The Mead Johnson terminal provides for the interchange of river, rail, and road traffic. Evansville dates from 1817 and became a city in 1847. Pop. 97,062.

**Evaporation** (Lat. *e*, from, out; *vapor*, vapour). Name commonly given to the process by which a liquid, and less commonly a solid such as carbonic acid snow, changes into a state of vapour. Evaporation may be said to be a function of heat and pressure. Liquids may evaporate at all temperatures; under the application

of heat or the removal of pressure from their surfaces, they evaporate more quickly. At a given temperature evaporation in a closed vessel ceases when a certain pressure of vapour is attained, for thin condensation of the vapour balances the evaporation of the liquid.

The rate of evaporation of a liquid depends upon the area of the surface exposed, the freedom of the space surrounding it from vapour, and the difference between the vapour pressure and the external pressure. Thus a given volume of a liquid evaporates more quickly in a shallow dish than a deep one, in a dry atmosphere than a damp one, and on a warm day than a cold one. The movement of the atmosphere over the surface of the liquid also increases the rate of evaporation, as the evaporated particles are carried away.

In converting a liquid into a vapour at the same temperature, heat has to be supplied. In other words, heat is absorbed in the process of evaporation. Evaporation thus produces a cooling effect, and this is the basis of refrigeration in certain types of ice-making machines. The quantity of heat that has to be supplied to one gram of liquid at the boiling point without changing its temperature is called the latent heat of vaporisation. This is the same thing as the quantity of heat given out by one gram of the vapour at boiling point, when condensing to a liquid at the same temperature.

Evaporation of water is of great importance in nature. It has been shown that the atmosphere gains as much from green grass-covered soil as from a water surface. Evaporation is at a maximum during the summer months owing to high surface temperatures, winds, and increased water-holding ability of the warmer air. On foggy winter days condensation rather than evaporation may be the rule. When percolation into the soil is small, evaporation is given by the difference between rainfall and run-off. See Boiling Point; Condenser; Heat.

**Evaporation Value.** Method by which the relative values of different fuels may be expressed. It consists in stating the amount of water which each is capable of converting into steam when the fuel is burnt under specified conditions. Thus one pound of average coal can theoretically convert 15 pounds of water at boiling temperature in the atmosphere into steam; while under the same conditions petroleum would convert

21 pounds, and ordinary dry straw 8½ pounds. These figures represent evaporation values. See Fuel.

**Evaporimeter.** An instrument for measuring rate of evaporation of water from a surface to the atmosphere. The most direct method of determining evaporation from a free water surface comprises observation of the level of water in a sunken tank, allowance being made for rainfall (*e.g.* Symons evaporimeter). Other evaporimeters are concerned with evaporation from natural grass and earth surfaces.

**Evatt, HERBERT VERE** (b. 1894). Australian politician. He was born April 30, 1894, at East



Herbert V. Evatt,  
Australian politician

Maitland, N.S.W., and educated at St. Andrew's college and Sydney university. Having been tutor in philosophy at St. Andrew's and lecturer in legal interpretation at Sydney, he was a Labour member of the N.S.W. legislative assembly, 1925-29. A justice of the federal high court, 1930-1940, he became attorney-general and minister for external affairs in 1941, representing his country at discussions of the Pacific war situation in Washington and Paris, at the San Francisco conference, and at the Paris peace conference. In 1946 he was appointed deputy prime minister. He attended the conference of Commonwealth prime ministers in London, Oct., 1948, and in the same year was chairman of the U.N. general assembly in Paris. He lost office with the electoral defeat of his party in 1949. Evatt published *Australia in World Affairs*, 1946.

**Eve.** Name of the first woman in the Biblical story of creation. In Hebrew the form of the name is Chawwah. It was given to the woman by Adam (Gen. 3, v. 20), and is explained as meaning "living" or "life." She was so called, it is stated, because she was the mother of all living. See Adam; Creation.

**Evection** (Lat. *e*, out; *vehere*, to carry). Inequality of the moon's motion, which increases or diminishes the mean longitude of the moon to the extent of 1 deg. 16 mins. at maximum.

**Evelina.** Fanny Burney's first novel. The first avowed novel of society, it was published anonymously in 1778 under the title of

Evelina; or a Young Lady's Entrance into the World. Johnson declared that there were passages in it which might do honour to Richardson.

**Evelyn, JOHN** (1620-1706). English author and diarist. He was born at Wotton House, Surrey, Oct. 31, 1620, educated at Lewes and Balliol College, Oxford, and became a student of the Middle Temple. Possessing ample means, he remained abroad during the greater part of the Civil War.



*After Holl*

A sincere royalist and churchman, his admiration for Charles II in exile did not blind him to the king's faults when, after the restoration, Evelyn enjoyed favour at court.

During 1653-94 Evelyn was settled at Sayes Court, Deptford, where he transformed a rude orchard and field of 100 acres into a pleasure of notable charm. He befriended Jeremy Taylor and other divines, and was on terms of intimacy with Bentley, Boyle, Pepys, Grinling Gibbons, and Hollar. He helped to found the Royal Society, and was its secretary in 1672. He was a commissioner for the rebuilding of St. Paul's Cathedral; aided church establishment in the plantations; was a commissioner of the privy seal, 1685-87; and treasurer of Greenwich Hospital, 1695-1703. In addition to gardening and forestry, he took an active interest in agriculture, architecture, art, engraving, music, and navigation. His *Sylva*, 1664, first drew attention to the importance of afforestation in England; *Terra*, 1676, was a first attempt in English at a scientific study of agriculture; *Sculptura*, 1662, a work on engraving, was suggested by Boyle. He wrote a *Character of England*, 1659, an admirable *Life of Mrs. Godolphin*, a discourse on Medals, and a *History of the Dutch War*, which is lost.

He is best remembered for his *Diary*, 1620-1706 (more properly memoirs), a work valuable for its reflection of the political, social, and religious life of his time. Descriptions of the fire of 1666 and the great storm of 1703 show that he could write vividly. The MS was in danger of destruction when, at the suggestion of William Upcott,

it was edited by William Bray, and first published in 1818. After 1694 Evelyn lived at Wotton, where he died, Feb. 27, 1706, and was buried in the chapel. He is well described as a patriot who kept his loyalty in dangerous times, a Christian who preserved his integrity in the most immoral, and a philosopher who viewed every object with a desire to extract from it all the beauty and goodness it contained. Consult editions of the *Diary*, with *Life* by H. B. Wheatley, 1906; and by Austin Dobson, 1908; *Life*, Lord Ponsonby, 1934.

**Evening News, THE.** London evening newspaper. Started in 1881 in the Conservative interest as a rival to *The Echo*, in 1889 it absorbed *The Evening Post*, founded 1887. In 1894 it was acquired for £25,000 by a new company of which Alfred Harmsworth (Viscount Northcliffe), Harold Harmsworth (Viscount Rothermere), and Kennedy Jones were the proprietors. Under the new direction it emerged from an almost moribund concern into a property yielding in the first year a profit of £14,000 and in the second £25,000. Its ever-increasing success—it had in 1947 a net sale of 1,641,394—led to the foundation of *The Daily Mail*. From 1894 until 1896 Kennedy Jones was editor; he was succeeded by W. J. Evans. F. L. FitzHugh was editor 21 years, retiring in 1944. Prominent regular contributors have included Claude Burton (C. E. B.), Oswald Barron (The Londoner), the cartoonist P. H. Fearon (Poy), Arthur Machen, Sir John Squire, Frank Swinnerton, Frances Pitt, and the humorous artist Joseph Lee. It is issued by The Associated Newspapers, Ltd. See Northcliffe, Viscount.

**Evening Primrose** (*Oenothera biennis*). Biennial herb of the family Onagraceae. It is a native of N. America.



Evening Primrose, a biennial herb

The leaves are oblong-lance-shaped; the flowering stem (2nd year), 4 ft. or 5 ft. high, branched, with narrower, toothed leaves, terminates in a long spike of large, pale yellow flowers, opening in the evening. The variety *lamarckiana* has much larger flowers than the type form, and has been much studied. See *Mutation*.

**Evening Schools.** Term specifically given to evening classes established in the United Kingdom, mainly during the first half of the 19th century, for giving elementary instruction to illiterate adults. One of the earliest was started at Bala, N. Wales, in 1811. The system was warmly supported by Bishop Hinds in 1839, and was adopted by the Ragged School Union, founded 1844, and known since 1898 as the Shaftesbury Society. The term is still unofficially applied to schools in which pupils beyond the compulsory school age may continue to study. See Further Education.

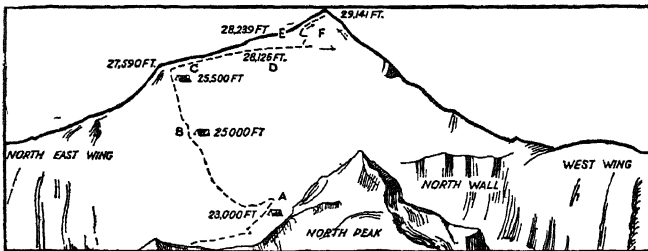
**Evening Standard, THE.** London evening newspaper, started June 11, 1860, as a pendant to its morning namesake, itself originally an evening paper first published May 21, 1827. Acquired from the Johnstone family in 1905 by C. Arthur Pearson, who had in 1903 purchased the *St. James's Gazette* (founded in 1880), *The Evening Standard* was merged with the latter. In 1910 Davison Dalziel secured the controlling influence; in 1915-23 it was owned by Hulton & Co., and from 1924 by Lord Beaverbrook. Famous regular contributors have included Arnold Bennett, Dr. W. R. Inge, and the cartoonist David Low.

**Evenlode.** Tributary of the river Thames, in Oxfordshire, England. Rising near Kingham on the Gloucestershire border, it flows generally S.E. to join the main river between Eynsham and Yarnton, 4 m. N.W. of Oxford.

**Evensong.** Form of worship prescribed by the Prayer Book of the Established Church. First drawn up in 1549 and revised in 1552 and 1662, it consists of responses, psalms, lessons, and collects taken from the services of vespers and compline in the medieval breviary, with additional features such as general confession and absolution, prayers for king, clergy, people, etc.

**Everest.** The world's highest mt., 29,141 ft. (official alt. is still 29,002 ft.). It is in the Himalayas, on the border between Nepal and Tibet. Named after Sir George Everest (1790-1866), surveyor general of India, its peak has often been confused with that of its neighbour, Gaurisaukar. It is covered with snow and difficult of access; practically every expedition to Everest has entailed heavy loss of life, and the summit still remains unscaled.

Of the expeditions on foot, those in 1921 and 1935 were



**Everest.** Diagram showing at A, B, and C the positions of the three highest camps established by all climbers. D, height reached by Norton and Somerville, June 4, 1924. E, spot where Mallory and Irvine disappeared, June 8, 1924. F, broken and dotted lines indicate alternative proposed routes to the summit

reconnaissance, and those of 1922, 1924, 1933, 1936, and 1938 attempts to scale the mountain. Two members of the 1924 expedition, A. C. Irvine and G. L. Mallory, reached 28,800 ft. and then set out alone to climb the remainder of the distance; they disappeared at 28,239 ft., though it was generally believed that they reached the summit and were unable to return.

**EVEREST AIR EXPEDITION.** In 1932 Lt.-Col. L. V. Stewart Blacker and Col. P. T. Etherton formulated plans to explore Everest by air. The proposal was approved by the Air Ministry, Royal Geographical Society, and the government of Nepal. Lady Houston largely financed the project, which was named the Houston-Everest expedition. Two Westland biplanes were fitted out, and cameras, respiratory oxygen, and electrically heated clothing carefully selected. The base was at Purnea, 260 m. N. of Calcutta and about 150 m. from Everest. The first flight was made on April 3, 1933. Everest's characteristic plume (composed of ice particles) indicated a terrific wind, soon found to be about 110 m.p.h., but the summit was surmounted for the first time in history. Thirty-five successful oblique photographs were obtained, but the dust haze ruined all vertical survey photographs. Kinchinjunga was explored next day. A second flight to Everest was made on April 19, when vertical photographs of unexplored territory around the peak led to more accurate mapping.

**Everett.** City of Massachusetts, U.S.A., in Middlesex co. It

stands on the Mystic river 3 m. N. of Boston, and is served by the Boston and Albany rly. Its industrial activities include ironfoundry, oil refining, and the manufacture of chemicals, paints and varnishes, tools, optical goods, and leather goods. Settled 1630, it was incorporated 1870. Pop. 46,784.

**Everett.** City of Washington, U.S.A., the co. seat of Snohomish co. A port of entry on an arm of Puget Sound, it is 30 m. by rly. N. of Seattle. Situated in a mineral, lumbering, agricultural, and fishing region, it has an excellent landlocked harbour and two airports. Settled in 1862, it was incorporated as a village in 1892, and became a city in 1908. Pop. 30,224.

**Everett, EDWARD** (1794-1865). American statesman and orator. Born at Dorchester, Mass., April 11, 1794, he was for two years a Unitarian minister. He became professor of Greek at Harvard, 1819-25, and president, 1846-49. He edited the *North American Review*, 1820-24, was member of congress 1824-35, minister to

Great Britain 1841-45, and senator 1853-54, when he abandoned public life. In politics Everett was a Republican, and when the Civil War broke out he strongly supported the cause of the Union, although to the last he had hoped that war might be averted. He died at Boston, Jan. 15, 1865. His reputation chiefly rests upon his lectures and speeches. *Orations and Speeches* were published 1850-59. *Consult Life and Services*, R. H. Dana, 1865; *Life*, P. R. Frothingham, 1925.

**Everglades.** Swampy wilderness in S. Florida, U.S.A. The region is low-lying and its heavy rainfall and high temperature encourage the rank growth of vegetation, thus increasing the natural difficulty of drainage. Situated mostly in Dade co., it extends N. to S. for about 120 m. and is about 50 m. broad. During the rainy season it has a depth of 1 ft. to 10 ft. It contains a number of islands bearing cypresses, pines, palms, and vines, but is mainly a huge, almost impenetrable, tract covered with saw-grass which reaches a height of 6 ft. Projects undertaken by private firms and state and federal governments, including construction of 450 m. of drainage canals and the 140-m. Cross-Florida Waterway, have effected the reclamation of several million acres. One result is the cultivation of sugar cane, some of which reaches a height of 20 ft.; lemon, orange, and rubber trees also grow here, and lettuce, string beans, and cabbage are cultivated to some extent. The state and university of Florida have established the Everglades experimental station, where the agricultural possibilities of the region are studied. Characteristic features are the palm-thatched huts of the Seminole Indians. *See Florida.*

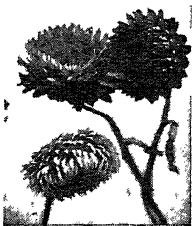
**Evergreens.** Plants whose leaves last several years and are not shed simultaneously. The plants are thus never leafless. The holly, for example, produces new leaves each season, but each of these lives for three or four years; therefore, although there is a leaf-fall every year, it affects only the oldest leaves and the foliage as a whole is always full and green. Evergreen leaves are of leathery consistence with glossy surface, and are thus protected against rapid loss of moisture in summer and the effects of frost in winter.

**Everlastings** OR IMMORTELLS. Term applied to the flower-heads of certain composite plants. Their bracts are of a hard, parchment-



Everest from Mt. Phalut, Darjeeling. Over five miles high, its summit is the loftiest in the world

like character and coloured, so that if gathered in their prime, *i.e.* just before they are fully expanded, they will retain their form and colour for several years. The most striking of these are species of *Helichrysum*, *Acroclinium*, *Rhodanthe*, *Aphelexis*, *Waitzia*, and *Xeranthemum*. After they are gathered they should be hung heads downwards to ensure perfect drying.



Everlasting Flowers  
of *Helichrysum*  
*bracteatum*

**Evershed**, SIR FRANCIS RAYMOND (b. 1899). British judge. Born Aug. 8, 1899, he was educated at Clifton and Balliol College, Oxford, and called to the bar in 1923. He was chairman of the central price regulation committee, 1939-42; controller of the Notts, Derby, and Leics coal-producing region, 1942-44; and chairman of commissions on cotton-spinners' and dockers' wages, and of a committee on supreme court practice and procedure. He was appointed chancery judge, 1944, lord justice of appeal, 1947, master of the rolls, 1949.

**Eversley**. Village and parish of Hampshire, England, 14 m. N.E. of Basingstoke. The church of S. Mary, early 18th cent., had Charles Kingsley for its rector 1844-1875. He is buried in the churchyard. Near is Bramshill House, erected for Prince Henry, son of James I.

**Eversley**, CHARLES SHAW-LEFEVRE, 1ST VISCOUNT (1794-1888). British politician. Born Feb. 22,



1st Viscount Eversley, Hants during  
British politician  
1832-57. After

serving as chairman of various committees, he was elected speaker in 1839, and filled that office with distinction, reforming procedure and maintaining order in the difficult times of O'Connell and the free trade debates. In 1857 he retired, becoming Viscount Eversley. He died at Heckfield, Hants, Dec. 28, 1888. The title became extinct, but was revived as a barony in 1906 in favour of his nephew (*v.i.*).

**Eversley**, GEORGE JOHN SHAW-LEFEVRE, BARON (1832-1928). British politician. Born June 12, 1832, he was educated at Eton and Trinity College, Cambridge. As a Liberal he was M.P. for Reading, 1863-85, and for Bradford, 1885-95. He was civil lord of the admiralty in 1856; secretary to the board of trade, 1869-71; first commissioner of works, 1881-83 and 1892-93; postmaster-general, 1883-84; and president of the local government board, 1894-95. Raised to the peerage in 1906, he died April 19, 1928.

**Everton**. Parish of Lancashire, England, forming a N.E. suburb of Liverpool, and within its borough limits. Here is S. Edward's Roman Catholic College, founded 1842 and enlarged in 1875. It stands in its own grounds of 11 acres. Everton is celebrated for its toffee and its football club (*v.i.*).

**Everton**. Association football club. Founded in 1878 in a Methodist chapel, it first played in Stanley Park, Liverpool, on the opposite side of a road from the present enclosure, Goodison Park. Everton was one of the twelve clubs that founded the Football League in 1888, and except in the season 1930-31 has always played in the first division. It won the League championship in 1891, 1915, 1928, 1932, and 1939; and the F.A. Cup in 1906 and 1933. It has the unique record of gaining in three successive seasons (1930-33) the championships of the second division and first division, and a Cup victory.

**Everyman**. English morality play of the late 15th century, probably translated from its Dutch counterpart, *Elckerlijck* (printed c. 1495). The earliest known editions of *Everyman* were printed by Richard Pynson (undated, but apparently before 1531). The play, which "comprises the whole pitiful pathos of human life and death," is one of the finest examples of the moralities. The story of God's summoning of *Everyman* (all mankind represented as an individual) by Death on that journey which none may escape, and of *Everyman*'s attempts to find a willing companion, is based on an earlier parable told in the religious romance of Barlaam and Josaphat (*q.v.*). A choreographic version by Mona Inglesby, with music from the tone poems of Richard Strauss, was performed by the International Ballet in 1943.

**Everyman's Library**. Name of a series of reissues of classics in ancient and modern literature of

every kind. This venture was started by J. M. Dent in 1906 and published by the firm bearing his name. Ernest Rhys was long the general editor. Each volume was given a preface by a leading authority, and by 1950 the library had reached a total of 988 out of the 1,000 which was the publishers' original aim.

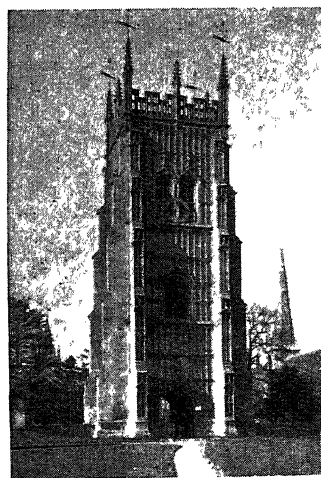
**Everyman Theatre**. Theatre at Hampstead, London, N.W.3. A drill-hall close to the tube station was acquired and fitted up as a small theatre with a seating capacity of about 300. This was opened on Sept. 15, 1920, with *Bonds of Interest*, a Spanish comedy by Jacinto Benevente, and other plays notable for their intellectual appeal followed. The theatre later became a cinema at which films of special interest were revived.

**Evesham**. Mun. bor. and market town of Worcestershire, England. It stands on the Avon, 15 m.



Evesham arms

E.S.E. of Worcester, and is served by two railway lines. S. Ewain founded a Benedictine monastery here in the 8th century, of which a bell tower, of fine ornate Perpendicular, and gateway still remain. The town hall is an Elizabethan structure, and the grammar school was founded by Abbot Lichfield in 1536. The battle of Evesham was fought at Green Hill; its site is marked by an obelisk. Fruit growing and market gardening are engaged in and the asparagus beds are famous. There is excellent boating on the



Evesham. Bell tower, survival of the 8th cent. Benedictine monastery

Avon. Market day, Mon. Until 1950 the town gave its name to a co. div. with one M.P. Pop. est. 11,500. About 2½ m. N.W. is Wood Norton, once the residence of French dukes, and a home of the B.B.C. early in the Second Great War. The famous and fertile Vale of Evesham is much visited in the season of fruit blossom.

**Evesham**, *BATTLE OF*. Fought Aug. 4, 1265, between the royalists under Edward, afterwards Edward I, and the baronial party under Simon de Montfort. Defections had broken Montfort's power, and in the summer of 1265 he was retreating before his foes. The force which his son Simon was bringing from the S. to join him was destroyed by Edward at Kenilworth, Aug. 1, and the elder Simon, falling back into Wales, halted at Evesham, Aug. 3. Prince Edward hastened up and cut off all chances of escape. His plans were so cleverly laid that Earl Simon exclaimed: "God have mercy on our souls, for our bodies are theirs." The royalists attacked in two divisions, and the battle was soon over. Numbers told; both Simon's horse and foot gave way, the former only after a stubborn resistance, and Montfort and his son Henry were killed.

**Eviction** (Lat. *evincere*, to overcome). Name given to the process of ejecting a tenant from a house or land. Since the First Great War severe limitations have been imposed on the right of landlords to evict tenants of houses within the Rent Restrictions Acts. *See* Distraint; Ireland; History.

**Evidence** (Lat. *evidentia*). Word used for the legal method of proving facts in a court of law. The law of evidence is one of the chief points of difference in the administration of justice between English-speaking countries and others. English courts are very strict in their admission of evidence, or rather in their exclusion of certain matters of evidence and modes of proof. The chief rules of evidence are: (1) All evidence must be relevant to the issue; (2) such relevant matters must be proved by the "best" evidence.

Relevancy is really a matter of logic. How far any given fact offered to be proved tends to prove any matter in issue is for the judge to decide. One or two things may be borne in mind. A witness's opinion (e.g. "I think the driver of the car was to blame") is no evidence. It is never relevant, except where technical matters are in dispute, and then the opinion of

skilled experts is admitted because there is no other way of arriving at the facts. The character of the parties is not relevant; if I sue a man for damages for fraud I am not allowed to call 50 witnesses to show that he is a man who has committed other frauds. All I am allowed to do is to cross-examine him as to his character, and try to drive him to admit that his record is bad. But even this is not evidence that he defrauded me.

The only time a plaintiff, or prosecutor, can call evidence of the kind above described is where the evidence shows a system of wrongdoing, and the act in issue is a part of the system—long term frauds for example. On the other hand, a man accused of crime may always bring evidence of his good character. Even in libel it is not permissible to prove misconduct by the plaintiff so as to show he has a bad character unless the defendant has justified the libel—although evidence of generally bad reputation may be given.

The rule of best evidence is a rule of exclusion. It excludes hearsay. If you wish to prove something seen or heard, you must put in the box the man who saw or heard it, and not (with certain exceptions) a man who heard that another man saw or heard it. The contents of a document must be proved by producing the document itself. If the document is, or has been, in the possession of the other side, which does not produce it after notice to do so, secondary evidence may be given. Again, if the judge is satisfied that it has been lost, stolen, or destroyed, secondary evidence is admissible. Bankers are allowed, instead of producing their books in court, to send a certified copy. There are whole classes of public documents, such as entries in marriage, birth, and death registers, wills, or bills of sale, which can be proved by officially certified copies.

These rules remain in full force for all criminal proceedings, but in civil proceedings some relaxations were introduced by the Evidence Act, 1938. Where direct evidence of a person by word of mouth would be admissible, any statement made by him in a document may be used if either he had personal knowledge of the facts or, where the document is part of a continuous record—e.g. an account book—he made entries or other statements as part of his duty and obtained the facts from someone who might reasonably be supposed to know them. The

maker of the statement must generally be called. The court may, however, admit a copy of the document containing the statement instead of the original. Statements cannot be used if made by an interested person at a time when proceedings were either pending or were anticipated.

There are long established exceptions to the hearsay rule applying to statements either oral or in writing. In pedigree cases, statements by a deceased member of the family—e.g. in a Bible—made before the litigation may be used. In all cases, declarations against interest, e.g. by a deceased person, may be admitted. In trials for homicide, declarations by the person killed are admissible to prove the circumstances of death, provided he knew that he was dying. *See* Jurisprudence; Law.

**Evidences of Christianity**, *A VIEW OF THE*. Theological work by William Paley first published in 1794, containing (1) the direct historical evidences of Christianity; (2) the auxiliary evidences; and (3) a consideration of some popular objections. Largely based on Butler's Analogy of Religion and Nathaniel Lardner's Credibility of the Gospel History, the work, in its time hailed as a crushing reply to scepticism, has come to be regarded as inadequate.

**Evil**. In the theological and ethical sense the absence of good, or unsatisfied desire. Neither definition is satisfactory. To say that evil is the absence or the opposite of good at once raises the question, "What is good?" and the answer must depend largely upon the standpoint of the individual. To define evil as unsatisfied desire pre-supposes that the desire itself is not evil. If it is, its frustration is good rather than evil. To find the supreme good in the satisfaction of desire, and evil in its frustration, ignores the possibility of a higher and external moral imperative taking precedence over mere personal desire.

From the theological point of view, the definition of evil is comparatively simple. It is that which does not conform to the Will of God. But the Will of God is manifested by both direct command and by permission. Evil, like all other things, can only exist by divine permission; and in this sense its existence is not contrary to the Will of God. But the thing in itself and the fact of its existence are not the same thing. The Will of God may permit the existence of an evil which is itself directly

opposed to that Will; and such permission in no sense makes God the author or the cause of evil.

Why evil is permitted to exist has always been a perplexing problem; and it is not greatly helped by the counter question: "Does evil exist?" If evil is a mere negation or absence of good, it has no real existence, and is nothing at all. What really happens is that the good exists in a less degree than is to be desired. The existence of so-called evil, therefore, resolves itself into this—that the universe is not perfect. Viewing evil as merely imperfection, the problem of its existence becomes less difficult. It is no reflection on the goodness of God that He is pleased to let the world progress through imperfection to perfection.

Another element in the problem of evil is that of relativity. In certain circumstances and in some relations a thing may be evil which is not necessarily evil in itself. But we are not in a position to judge the circumstances or to weigh the relations; for the simple reason that only a portion of the world of reality lies within our ken. We see only part of the machine; and those parts which appear inappropriate or superfluous may be essential or beneficial to the part of which we know nothing. See Ethics.

**Evil Eye.** Faculty of causing material harm by means of a glance. In Shakespeare, and in modern rural England, it is called overlooking. From its ancient Roman name *fascinum* comes the word fascination. Distinguishable from the subjective influence of the eyes of snakes, it denotes a form of witchcraft, owing its origin to the presumption that the eye is capable of operating at a distance. It may be exerted, voluntarily or involuntarily, upon human beings and domestic animals, especially when young, besides crops, dwellings, and other objects. Envy (Lat. *invidia*, on-looking) is a potent incentive of evil eye.

The belief is traceable to the beginnings of recorded history, and its widespread survival in primitive culture attests its primeval origin. Various curative and preventive measures are employed. Prevention is sought by spitting, muttering counter-charms, making offensive figures or gestures, giving to children opprobrious names, wearing knotted cords, or displaying amulets, many of which are specific for evil eye. They include representations of eyes, hands, horns, teeth, shells, nuts, lunar

crescents, red and blue objects, and magical or sacred texts. Evil eye is referred to by its technical name in Gal. 3, where it is translated "bewitched." The Greek belief is enshrined in the mythical gorgon Medusa, whose glance turned its victims to stone; the use of the gorgon's head as an amulet persists in doorknockers. See Divination; Magic.

**Evil-Merodach** (d. 560 B.C.). King of Babylon. The name is the Biblical spelling of the cuneiform Amel-Marduk, servant of Marduk. He succeeded his father, Nebuchadnezzar II, and after a career of tyranny and unrestraint was, within two years, violently slain by his brother-in-law, the Nergal-sharezer of Jer. 39.

**Evocator.** Any substance which, when applied to eggs in the early stages of their development, evokes responses leading to the production of recognizably differentiated tissues or organs.

## EVOLUTION: THE SHAPING OF LIFE-FORMS

\*Paul G. 'Espinasse and J. Arthur Thompson, LL.D

*This important article can well be supplemented by those on Anthropology; Biology; Life; Man; Sex. See also Cell; Heredity, etc.; and Darwin; Galton, and biographies of other biologists*

Evolution (Lat. *evolvere*, to unroll) is a process wherein one kind of living creature gives rise to another kind, which persists alongside of or in place of the original stock. Thus we believe that birds evolved from an ancient reptilian stock, and mankind from a primitive simian lineage, the origins in both cases being extinct. In the case of domestic pigeons derived from the wild rock-dove (*Columba livia*), or of poultry derived from the jungle-fowl (*Gallus bankiva*), the origins are still extant. Similarly, wild ancestors of such cultivated plants as cabbages and apple-trees still exist. The evolutionary process is going on among wild plants and animals, e.g. in some evening primroses, or in many birds and butterflies, but is not often easily detected in a lifetime or in the relatively short time since precise biological registration began.

While evolution is strictly a slow racial change in living creatures, the term is often used much more widely. Evolution should not be confused with development, which is best restricted to a continuous change in one and the same unity, such as a germ, a seed, an organ, an institution, or a solar system. Development agrees with evolution in being a series of changes in a definite direction from one position of equilibrium

Many evocators are known chemical substances and have much in common with hormones (q.v.). See Embryology.

**Evolute** (Lat. *e*, from, out; *volvere*, to roll). In geometry a curve which is the path of all points that are the centres of curvature of a second curve called the involute. To measure the curvature of any involute we find a circle which coincides with the curve for a short distance. If the curvature to be measured is great this circle of curvature can only have a small radius because it will accompany the first curve only a small way. If the curvature is small the radius of the circle will be correspondingly larger. The centre of this circle at any point on the curve is the centre of curvature at that point. It is clear that there will be a number of these circles for any curve. When their centres are all joined up they form the evolute. See Circle; Geometry.

to another, but differs from it in concerning one and the same individual system from beginning to end, whereas evolution is racial, implying a succession of generations and a sifting process. Briefly, development in biology is the individual's coming to be (Ontogeny); evolution, in biology, is the genetic history of a race (Phylogeny). Hence we should speak of the development, not of the evolution, of the earth.

Evolution may be in the direction of increased complexity and control (differentiation and integration), or in the opposite direction. A tapeworm is the result of a process of evolution just as surely as is the golden eagle within which it lives. Yet in spite of many instances of retrogressive evolution in animate nature, the general trend of the process has been progressive, i.e. towards increased differentiation and integration of fuller and freer life. This fact must never be lost sight of in contemplating the history of things as a whole.

As applied to living creatures, the evolution theory states the broad idea that the present is the child of the past and the parent of the future. The fauna and flora of today, both in themselves and in their myriad inter-relations, are the outcome of an antecedent state



of affairs in which animals and plants were on the whole rather simpler. This again originated in organisms and relations simpler still, and so on back through hundreds of millions of years, until all clues are lost, and we find ourselves in the mist of life's beginnings. The evolution theory thus states the view that the manifold intricacy of animate nature has arisen by a natural process of slow organic change, similar to that seen in the history of domestic animals and cultivated plants.

One point remains to be emphasised. The statement that living creatures have come to be as they are by evolution, only means that their history has been a natural history, the moves in which have known, or at any rate knowable, causes. To think that any result whatsoever acquires dignity, permanency, worth, invulnerability, or sanctity, because it is the result of evolution, is a misunderstanding, for the value of survival, as judged by human standards, depends on the conditions under which survival is secured.

#### Evidences of Organic Evolution

This general evolution theory, or doctrine of descent, is the only scientific way of answering the question: How has the present-day system of animate nature come into being? But while many facts of zoology and botany serve as evidences of evolution, four main lines of argument have been followed by Darwin and others.

The first is mainly anatomical. Many facts in regard to structure corroborate the evolutionist interpretation, and seem to naturalists to admit of no other. Thus, the fore-limb of a frog, the paddle of a turtle, the wing of a bird, the fore-leg of a horse, the flipper of a whale, the wing of a bat, the arm of a man, exhibit in diverse guise the same essential parts, twisted into manifold forms for different uses, but always of the same fundamental type. There is essential similarity in the important bones, and considerable resemblance in the musculature, innervation, and blood-supply. All these fore-limbs are homologous with one another, i.e. they agree in fundamental structure and development. It is difficult to understand this adherence to type except on the theory of the actual flesh-and-blood relationship of backboned animals. Many vestigial organs in animals, especially the higher animals, remain very slightly developed and are of no use; comparable, as Darwin said,

to unpronounced letters in words, the o in leopard, or the b in doubt. Man has a minute useless third eyelid and a hint of muscles for moving the trumpet of the ear. The only rational interpretation of such structures is the evolutionist one, that they are dwindling relics of structures well developed and of some functional importance in ancestral forms.

#### The Physiological Argument

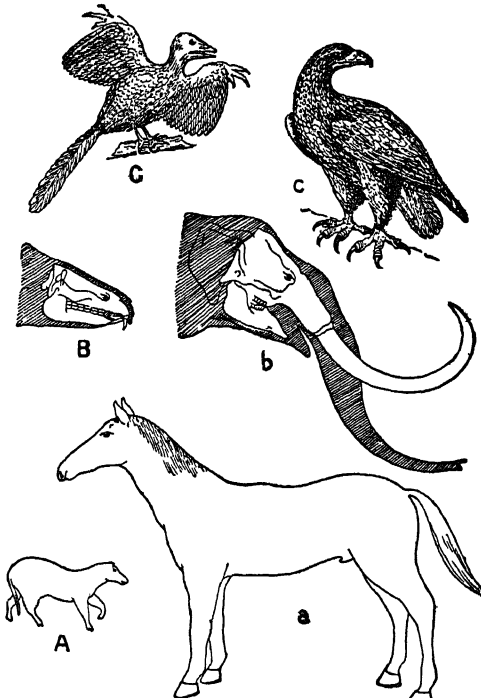
The second line of argument may be called physiological. When the blood of, for instance, a horse is injected into, say, a rabbit, the rabbit makes an "anti-horse" substance which will violently and immediately attack horse blood. It will not attack the blood of a bird, but it will attack to some extent the blood of an ass. This means that an ass has blood more like that of a horse than is the blood of a bird. By modification of this experiment it is possible to gauge the degree of relationship between man and the various groups of apes and monkeys. Along with this physiological argument may be taken the abundant

evidence of the variability of living creatures. In a short time man has established over 200 breeds of domestic pigeons, which seem all to have been derived from the blue rock-dove.

Another line of argument is historical or palaeontological. From the rock record we have accumulated a great mass of material in regard to the successive appearance of horse-types, elephant-types, crocodile-types, and so forth, all reading like a lineage or pedigree. Moreover, there are many connecting links now extinct, such as *Archaeopteryx* (see Birds), which, though an indubitable bird, has several well-marked reptilian features, e.g. teeth in both jaws, a lizard-like tail, and claws on the three digits of the hand. Again, there is the big fact that in the rock record amphibians appear after fishes, reptiles after amphibians, birds and mammals after reptiles; as age succeeded age, nobler and nobler forms of life emerged.

The embryological evidence is very striking. The embryos of the higher vertebrates, viz. reptiles, birds, and mammals, develop for a considerable distance along the same road, or along closely parallel roads, before they diverge. For instance, in the neck region of the embryo higher vertebrate, there are gill-clefts or visceral clefts which have no respiratory significance, and can hardly be said to be useful, except that the first becomes the Eustachian tube connecting the ear passage with the back of the mouth. These can only be recapitulations of some of the embryonic stages of the respiratory apparatus of remote aquatic, lower vertebrate ancestors.

There was a time when the temperature of the earth was far too high to admit of the existence of



Evolution. Early and late stages in evolution. A. Early four-toed ancestor of the horse. Its proportionate size is shown by comparison with a. B. Head and skull of an early ancestor (*Meritherium*) of the elephant, whose head and skull are shown in b. C. The oldest known bird, *Archaeopteryx*, two specimens of which have been obtained from Jurassic strata, compared with c, golden eagle.

By courtesy of Alex. Melrose

any forms of life like those we know. Whether germs of living organisms reached the earth from elsewhere, or whether very simple living organisms evolved upon the earth out of non-living matter, is unknown, but it is certain that living organisms did have a beginning upon the earth, and probable that the first organisms resembled in some respects present day viruses. Some of these may have given rise to the bacterial type of organism, consisting of a minute globule of chromatin surrounded by an organized envelope. As time went on and size increased, the chromatin-globules might increase in number and acquire some complexity of arrangement, and a non-chromatinic ground substance (cytoplasm) might become organized around them to provide a special immediate environment or fairly elaborate envelope.

#### Prototype of the Animal

A predatory organism may have arisen by the formation, around a number of chromatin-grains, of such an enveloping matrix of semi-fluid substance capable of enwrapping and digesting living particles. This was a prototype of the animal, and it preyed upon other minute creatures. Later on, the chromatin-grains congregated to form a definite cell-nucleus in the midst of the active matrix, and a true animal was formed. These suggestions serve to indicate that in all probability a long journey had to be travelled before even the first true animals or plants made their appearance.

The next great steps probably consisted in the establishment of numerous distinct types of cellular organization. On the animal line of evolution, towards which the primeval amoeboid organisms pointed, there doubtless arose all sorts of specialisations of the creeping form, many with supporting skeletal framework. More active forms had lashes of protoplasm instead of outflowing threads and lobes. Others, with an enclosing cyst, were adapted for spending much of their life passively waiting for suitable conditions, or as parasites.

One of the primeval great events must have been the emergence of green plants. These perhaps originated among flagellate infusorians on the animal line which had been able to build up the green pigment chlorophyll, the most important substance in the world, next to living matter itself. The divergence between plants and animals was one of the greatest cleavages in

evolution. While all typical animals require organic food which has been worked up for them by other living creatures, green plants are able to utilise the energy of the sunlight in their chlorophyll machinery to manufacture from the carbon dioxide of the air complex organic compounds. Thus green plants feed at a low chemical level, on air, water, and salts, and build up nutritive materials which animals utilise.

Moreover, the plant is almost always surrounded by an envelope or cell-wall of cellulose, and this restriction, taken along with the poorly developed means of getting rid of nitrogenous waste-products, may explain the tendency to fixity shown by plant-life. We are unable here to follow the evolution of the plant world which went on simultaneously with that of the animal world. One of the striking general impressions is that of a succession of dominant groups, each reaching supremacy, and then yielding to another. Thus the gigantic club-mosses and horse-tails which made great forests yielded to Cycad-like forms and thereafter passed into relative insignificance; while the Cycadophytes in their turn yielded to the flowering plants.

#### First Multicellular Organisms

It was a red-letter day in organic evolution when "bodies" began to be, i.e. when some living creatures passed possibly to the multicellular grade of organization. Many flagellate infusorians form colonies or families of connected cells, the daughter-units formed by division of the mother-unit, remaining associated, instead of drifting apart to live isolated lives, and it was probably in some such way that multicellular organisms began. It must be clearly understood that the step was not primarily one of increase in size, for a rotifer or wheel-animalcule built up of a thousand cells is much smaller than a unicellular infusorian such as *Noctiluca* (q.v.).

Nor was the step primarily one of increasing complexity either of organization or of activity, for many ciliated infusorians, though acellular, are far more complex in plasmic architecture and in ways of life than the fresh-water polyps, divided into thousands of cells. The step was on to a new line of organization, the formation of a many-celled body in which scope was given to division of labour among the component units. The structural side of this is called differentiation. The at-

tainment of a multicellular body opened the way to unlimited specialisation of function, and, partly because of the increased efficiency of execution thus attained, also to an increase of size, which, other things being equal, counts for something in a rough and callous physical environment. The nemesis of this great step of gaining a body was apparently that organisms became liable to natural death in proportion to the complexity of the bodily framework. For natural death appears to result from the accumulation of wear and tear effects, and the failure of the ceaseless attempts to cope with these.

#### Evolution of Sex

Another big step was the evolution of male and female multicellular individuals within the same species, the two sexes being complementary in the process of reproduction which secures the continuance of the race. The biological significance of the evolution of sex among multicellular animals is that it offered opportunities for new permutations and combinations of qualities, for those new departures technically called variations and mutations. The separation of sperm-producers or males and egg-producers or females, which differ deeply in constitution, would also tend to increase the range of cross-fertilisation which is often advantageous, and would permit of a profitable division of labour between the parents in their relations to the offspring.

Differentiation includes a multitude of evolutionary steps. In the creature called *Volvox*, which consists of a thousand or ten thousand flagellate green cells united in a ball, all the component units, except those concerned with reproduction, are alike. There is little or no division of labour in the colony. In sponges, however, we see the beginnings of tissues, i.e. groups of similar cells performing the same functions. Thus contractile tissue, connective tissue, and flagellate lining tissue (or epithelium) appear among sponges. In the next great series of animals, the Coelenterata, other kinds of tissue, such as nervous and glandular, are differentiated, and in them we find the first occurrence of organs, such as the sensory, the digestive, and the reproductive organs.

In most sponges and Coelenterata, the symmetry of the body is radial, i.e. there is no right or left side; the animal is the same all round. This is well suited to a sedentary or drifting existence, but

for more strenuous life involving the pursuit of prey and mates, and the avoidance of enemies, bilateral symmetry, which virtually began among "worms," is incomparably more effective. It implies a right and a left side, a head end which leads the way, and a tail end.

With the acquisition of bilateral symmetry was associated the establishment of an anterior brain and the development of a head worthy of the name. This opened up another line of advance, technically called integration, in contrast to differentiation. Differentiation means increasing complexity of parts, integration means their more perfect unification and control; and one of the main functions of the nervous system is integrative.

#### Progressive Differentiation

The story of evolution, apart from retrogressive parasites and other degenerates, is one of progressive differentiation and complementary integration, and the evolutionist has to record a long series of achievements, *e.g.* an open food canal; a body cavity or coelom between the food canal and the body wall; striped or swiftly contracting muscle; a circulatory system for distributing digested food and oxygen throughout the body and for collecting waste; oxygen-capturing pigments such as haemoglobin; a segmented body as in earthworms; a renewable external armour as in crustaceans; muscular appendages first unjointed and then jointed; specialised sense organs such as eyes and balancers, improved respiratory arrangements reaching, within their limits, extraordinary perfection among insects; delicate adjustments for filtering out the poisonous nitrogenous waste of the body.

We can only allude to the establishment of the leading type of architecture represented by the various series of invertebrates or backboneless animals. Besides the sponges and Coelenterata, we have to deal with the great variety of worm-types; with the higher segmented worms or annelids; with the starfishes, sea-urchins, and the like forming the echinoderms; with the jointed-footed arthropods, such as crustaceans, insects, and spiders; with the unsegmented molluscs without appendages, such as bivalves, snails, and cuttles; and with many smaller groups.

A step of great magnitude was the origin of the backboneed animals or vertebrates. It is not unlikely that these emerged from the stock of sea-squirts or tunicates. Their origin meant a fresh start on

a new line of more masterful life. A dominant feature was the establishment of a relatively large brain protected by a skull, and of a long, spinal cord protected by the backbone. Of great importance also was the first appearance of bone and of an internal living skeleton (usually of bone) pervading the whole body, and contributing to integration. In the establishment of numerous glands of internal secretion, whose hormones or regulative substances are distributed by the blood throughout the body, a chemical integration began to operate, or to do so on a larger scale and more rapidly.

Skulls began with the hags and lampreys; jaws and paired fins, scales and typical gills, with the true fishes; digits, true lungs, vocal chords, and a mobile tongue with amphibians; the antenatal robes (or foetal membranes) known as amnion and allantois with the reptiles. A four-chambered heart happened twice: once in the ordinary reptiles such as the crocodilians; and once quite differently and independently in another group of reptiles which, before becoming extinct, gave rise to the mammals; warm-bloodedness, or keeping the temperature of the body approximately constant, began independently in birds and mammals, which also show an enormous advance in brain development; the usually prolonged antenatal connexion between mother and offspring is carried furthest in the placental mammals.

#### Instinct and Intelligence Compared

Along with the great structural advances, there went a functional progressiveness. The smooth working that marks even the simplest creatures is not lost with intricate organization; but the scope of the life is widened and its agency becomes more free. In a sense, the behaviour of a ciliated infusorian is just as perfect as that of a bird, but the range is narrower, and the resources are fewer. The behaviour of ants and bees is extraordinarily effective on the instinctive line (*see* Instinct), and in its way unsurpassable. It cannot be profitably pitted against the behaviour of a horse or a dog, which is on the intelligent line, for its range resources are narrower. The instinctive creature is apt to be sadly nonplussed by some slight alteration in the routine of its experience. What Sir Ray Lankester has called the "little-brain" type, rich in inborn or instinctive capacities but slow to learn, must be distinguished from the "big-brain" with little

ready-made equipment, but with prodigious educability.

The big-brain type came to its own in birds and mammals, and there convincing evidence is found of an inner mental life of experimenting, *i.e.* intelligence. Interesting also is the fact that, as an organism attains to complex efficiency and to more or less intelligent mastery of its environment, it is able to practise reproductive economy. There are fewer offspring, but there is less mortality.

#### Emergence of the Human Race

In the Early Eocene age, millions of years ago, there emerged an arboreal race, the Primates, differentiated from other mammals in digits, teeth, skull, and brain. From this stock there diverged in succession the New and Old World monkeys, the small anthropoid apes (gibbon and siamang), and the large anthropoid apes (orang, chimpanzee, and gorilla). This left towards the end of the Oligocene (or perhaps in the Miocene) a generalised human stem, from which there diverged in succession *Pithecanthropus* the erect, the slouching man of Neanderthal, and the early Briton of the *Sussex Weald*—known by the famous *Pittdown* skull. None of the offshoots came to much, it seems, but the main stem continued as the stock of modern man, pieced together in relatively recent times into African, Australian, Mongolian, and European races.

With the emergence of man evolution passed on to another grade. For there are several reasons for avoiding the false simplicity of regarding social evolution as no more than a continuation of infra-human evolution. The first and chief reason is to be found in man's undeniable apartness and pre-eminence as a rational and social person. Man is differentiated by his language, by his capacity for forming and experimenting with general ideas, *i.e.* by his reason, by his vivid self-consciousness of his own evolution and by purposeful determination to control it; and by his strong kin-instincts. The second reason is the fact that in social history we have to deal with integrates of social persons, operating as unities of a higher order. The third reason is the importance of what lies outside the individual, namely, in literature and art, the folk-ways of customs and tradition, the external registrations which we call institutions. New notes are struck, and the evolution of man, though continuous with, is more than a mere continuation

of, the evolution that goes on in infra-human animate nature.

While the general idea of evolution is accepted by most naturalists, there is great uncertainty in regard to the operative factors. The uncertainty is partly due to the difficulty of arguing from a meagre experience of the present to a past of many millions of years, and partly to the fact that the inquiry is still very young, for it virtually dates from Darwin's *Origin of Species*, 1859.

There are two main problems. The first asks how the continual emergence of new things, of changes or variations which make an organism appreciably different from its parents or its kin, is to be accounted for. The second asks what directive factors may operate on the variations which arise, determining their elimination or persistence and working towards the familiar but puzzling result—the existence of distinct and relatively well-adapted species.

Some of the peculiarities or observed differences distinguishing members of the same species can be shown to be individually acquired bodily modifications directly due to some peculiarity of nurture in the widest sense. But as there is no secure evidence that these characteristics are transmitted to the offspring, they can be only of indirect importance to the race. The raw material of evolution is furnished not by these modifications, but by variations which are inborn—variations of what are called genes.

#### Fluctuations and Mutations

Among variations in structure resulting from the interaction of these variant genes with the environment, there may be distinguished minute peculiarities, and larger abrupt sports of notable amount, such as a fantail pigeon or a copper beech. The former, Darwin's "individual variations," may be usefully termed fluctuations. The sports correspond to Galton's "transient variations," Bateson's "discontinuous variations," De Vries's "mutations," and the last term should be kept for them. The transmissibility of inborn fluctuations has been proved in a few cases, and it was Darwin's conviction that "it is by the accumulation of such extremely slight variations that new species arise."

As to the origin of those minute novelties, a falling out of some feature, or a rearrangement of certain characters displayed by ancestors, it is possible to think of

them as due to the intricate permutations and combinations that occur in the history of the germinal material in the germ-cells, especially during maturation and fertilisation.

But the baffling problem is the origin of the distinctively new, where the novelty seems qualitative, not quantitative, where a new pattern, like a genius, appears. At present science cannot go beyond tentative suggestions. Many facts suggest that some environmental influences, in particular certain radiations, may act as variational stimuli on the germ-cells and provoke mutation. It is also known that one species may differ from another in the number, shape, size, and structure of its nuclear bodies or chromosomes, and just as bacteria sometimes change suddenly in their physiological properties, so the chromosomes which last on from generation to generation may change in their stereochemical architecture or functional powers.

#### Factor of Natural Selection

The most clearly discerned directive factor in organic evolution is natural selection, the process by which, in the struggle for existence, certain variants of a species, marked from their fellows by the presence or absence of some character, are on that account favoured with longer life or more successful families than their neighbours, who are therefore sooner or later eliminated. The full title of Darwin's great work should be remembered: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*. He stated the gist of the theory, which Wallace had independently reached, in a couple of sentences: "As many more individuals of each species are born than can possibly survive, and as, consequently, there is frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance any selected variety will tend to propagate its new and modified form."

There are several different modes of natural selection; thus it is useful to distinguish between 'lethal selection,' which works by the discriminate elimination of the relatively less fit, and 'reproductive selection,' which works

through the increased multiplication of the relatively more fit. The operation of natural selection has been satisfactorily demonstrated in a few cases, and it is certainly a potent directive factor. To turn to a less difficult point, it is important to avoid the popular fallacy that natural selection works out the survival of the fittest in any absolute sense; what ensues is the survival of the relatively more fit to the given conditions—and this may not always imply desirability.

Yet the idea should be emphasised that natural selection operates in part in reference to a system of inter-relations which is continually becoming more complex, which is made up of many stable and beautiful and intelligent components that have stood the test of time. Therefore, natural selection does not work capriciously; we get at least a hint of the reason for its working on the whole progressively. Besides selection, some have recognised isolation as a directive factor; that is to say, all the barriers which restrict the range of intercrossing within a species. "I do not doubt," Darwin said, "that isolation is of considerable importance in the formation of new species."

#### Steady Development of Mental Processes

When we look back on the majestic process by which the present system of animate nature has come to be, certain general impressions arise in the mind. In the course of the ages there has been, in the animal world, a progressive evolution of the nervous system, an increasing elaboration of behaviour, a gradual increase of free agency, a growing emancipation of mentality. Since the beginning of life there has been on the part of living creatures an increasing appreciation and mastery of their world. To man, who is part and parcel of Nature, though also singularly apart from it, there is encouragement in the fact that we know of no reason for believing that the evolutionary process will stop.

Another highly important general impression of great interest is that while organisms are ever experimenting and tentative, proving all things, they are just as characteristically given to holding fast to that which is good. Species become extinct and races perish, but great organic inventions, such as amoeboid movement or haemoglobin or hormones, are carried on by some collateral lineage. There

is a strong power of conservation in the midst of the evolutionary flux.

As Lotze said, the process of evolution has the unity of an onward advancing melody. Retrogressions and involutions there have been and are, but the big fact is the growing to finer issues. With the progress of differentiation and integration (*i.e.* complexity and control) in organisms, there was correlated some degree of external registration in the system of inter-relations gradually established. For one result of organic evolution has been the weaving of a web of life whose pattern has become more and more intricate, as in the inter-relations between flowers and their insect visitors. The complexifying of relations has probably been of great importance in evolution, for it is in reference to this external system that new organic experiments are tested and that selection works. Thus it seems that the intensification of life has been in part secured and in part prompted by the growing complexity of the external system of nature.

Thus living creatures contribute to the evolution of their kind, not only directly by exhibiting variations and by personally testing these, but also indirectly by contributing to the complexifying of the external web of life. If this be so, there is for man the hint that progressive evolution depends not merely on the improvement of the natural inheritance and intensification of the individual life, but also on the ennoblement of the external heritage—so much man's own creation—the treasures of literature and art, the tradition of high ideals, and the multitudinous linkages, many in need of amelioration, in the framework of society.

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**Evora.** District of Portugal, in the province of Alentejo. It is bounded on the N. by the dist. of Portalegre and on the S. by the dist. of Beja. The river Guadiana forms its E. boundary. Hilly on the N.W. and S., it slopes E. and S., forming the basin of the Degebe and smaller streams flowing into the Guadiana. A large portion of the district is barren, but there are

cork-oak forests. Evora is the capital, and Montemor and Reguengos are other towns. Pop. 207,952.

**Evora** (anc. *Ebora*). City and archiepiscopal see of Portugal, capital of Evora dist. Beautifully situated on a low hill in a fertile plain, 72 m. by rly. E. of Lisbon, it is enclosed by ancient walls and towers, has many Roman and Moorish remains, and is as interesting as it is ancient. It has a cathedral, founded in 1186, a 16th century church, an art gallery, a museum, a Roman temple, various palaces, and a famous aqueduct. It manufactures cloth, cotton, and woollen goods, and hats, and trades in wine. In the vicinity are copper and iron mines, and marble and asbestos quarries. An important fair is held annually. A stronghold of Sertorius (*q.v.*) and the capital of Lusitania under the Romans, Evora was a bishop's see under the Visigoths, taken by the Moors in 715, and recaptured by the Christians in 1166. Pop. 28,042.

**Évreux.** City of Normandy, France. It is 67 m. W.N.W. of Paris, and stands on the Iton, a branch of the Eure, in the dept. of Eure, of which it is the capital. The earliest part of the cathedral of Notre Dame dated from the 11th century and some part from the 16th. It was completely restored at the end of the 19th. Other old buildings were the church of S. Taurin, a Romanesque building of the 11th century, to which an abbey was at one time attached, the episcopal palace, and the belfry. The hôtel de ville, museum, public library, and botanical gardens were notable. There are some small manufactures and a considerable agricultural trade.

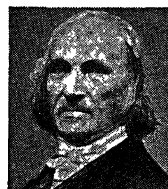
Évreux was frequently besieged and taken in the wars between England and France. At Vieil Évreux, 4 m. distant, extensive remains of a Roman theatre, baths, aqueduct, etc., have been unearthed. In the Middle Ages, the counts of Évreux were powerful nobles; the dignity was given in 1427 to Sir John Stuart of Darnley, a Scot in the French service. The English family of Devereux takes its name from here. In the Second Great War, on June 13, 1940, Évreux was bombed by the Germans, who occupied it shortly afterwards. U.S. troops liberated the town on Aug. 23, 1944. Pop. 20,436.

**Evzones** or **EVZONES.** Greek troops. They bear a variant of the name given to troops in the times of ancient Greece, *Euzonoi*, mean-

ing well-girdled, and so girt up for fighting. They are light troops consisting normally of about six battalions, and from their dress are known as the Greek Highlanders. Their uniform consists of a white kilt or *fustanella*, wide-sleeved white shirt, embroidered vest, red-pointed shoes, and blue-tasselled red cap. The Evzones fought in Macedonia and Serbia in the First Great War, and in the Second distinguished themselves against the Italians in Albania and against the Germans in Greece.

**Ewald, CARL** (1856-1908). Danish novelist. Born in Slesvig, when a child he removed with his family to Copenhagen after the annexation of the duchy by Germany. He started in active work as a forester, but turned to novel writing, in which he won distinction. In *The Old Room* he depicted a rebel against orthodox life, and in *Cordt's Son* his opposite in a strict observer of the conventions. Several of his stories have been translated into English by Teixeira de Mattos, notably *Two-Legs and Other Stories*, 1907; *My Little Boy*, 1908; and *The Pond and Other Stories*, 1909. *Pron.* Ayvahlid.

**Ewald, GEORG HEINRICH AUGUST VON** (1803-75). German Biblical critic and Orientalist. He was born Nov. 16, 1803, at Göttingen, where



Heinrich Ewald,  
German scholar

in 1831 he became professor of Oriental languages and philosophy. In 1838 he was appointed to the chair of Theology at Tübingen, and in 1848 returned to Göttingen, where in 1867 his retirement came about through political complications. His numerous works include a Hebrew Grammar, 1827, but the most important was his *Geschichte des Volkes Israel*, 1843-59. His criticism was cautious, and he exposed the extreme views of the Tübingen school. He died May 4, 1875. *Pron.* Ayvahl.

**Ewald** or **EWALD, JOHANNES** (1743-81). A Danish poet, born Nov. 18, 1743, at Copenhagen. Yearning for change and adventure, while still a student at Copenhagen university he joined the army of Frederick the Great, then engaged in the Seven Years' War, but later deserted to the Austrians. In 1760 he returned to Denmark and resumed his studies. A cantata written in 1766 on the death of Frederick V of Denmark

placed him in the front rank of lyric poets; but his drama, *Balder's Death* (1773), in which he introduced the old gods of Scandinavian mythology, first ensured his fame and gave an immense stimulus to the national pride in the legendary past of Denmark. George Borrow's English translation of this was published in 1889. Other well-known works are *Adam and Eve*, 1769, and *The Fisherman*, 1778. Ewald died March 17, 1781. His *Collected Works*, ed. H. Brix and V. Kuhr, appeared in 1941.

**Ewbank**, THOMAS (1792-1870). British author. Born at Barnard Castle, March 11, 1792, at the age of 13 he was apprenticed to a plumber, and in 1812 obtained employment in London as a labourer. He emigrated to America about 1819, and started a metal tube manufactory in New York, from which business he retired in 1836. After travelling in Brazil, 1845-46, he published his *Life in Brazil*, 1856. Ewbank was commissioner of patents 1849-52. The remainder of his life was largely spent in writing on engineering subjects. He died in New York, Sept. 16, 1870.

**Ewe** (Lat. *ovis*, a sheep). Word used for the female of the sheep (*q.v.*) and of other animals.

**Ewé**. African language-group. Mostly found in Dahomé, S. Togoland, and the Gold Coast Colony, it forms part of a primitive W. Sudanic speech once widespread in the Guinea region before the advent of Bantu influences. Of the Ewé speaking peoples the chief tribes in French Africa are the Dahomé and Mahi; the tribes in British Africa include the Awuna, Agbosomi, and Krikor, E. of the Volta river. The racial type tends to be shorter, fairer, and rounder-headed than that of the true negro.

**Ewell**. This town of Surrey, England, is part of the borough of Epsom (*q.v.*).

**Ewell**, RICHARD STODDERT (1817-72). American soldier. Born at Georgetown and educated at West Point, he fought against the Mexicans and Indians, but on the outbreak of the Civil War resigned his commission to fight for the Confederacy, and took part in both battles of Bull Run, Antietam, Chancellorsville, Gettysburg, and others. In the closing days of the war, on April 6, 1865, Ewell and his force were captured by Sheridan at Sailor's Creek. He died at Springfield, Tenn., Jan. 25, 1872.

**Ewer**. Pitcher or jug with a wide mouth. It is used particularly for holding water for toilet

purposes. The word is a corruption of Lat. *aquarium*, watering place; cf. Fr. *eau*, water. See *Damascening* *illus.*

**Ewing**, ALFRED CYRIL (b. 1899). British philosopher. Educated at University College, Oxford, he was assistant lecturer in philosophy at Swansea university, 1927-31, and was then appointed lecturer in moral science at Cambridge. His publications included *Kant's Treatment of Causality*, 1924; *The Morality of Punishment*, 1929; *Idealism*, 1934; *Reason and Intuition*, 1941.

**Ewing**, SIR JAMES ALFRED (1855-1935). British physicist and engineer. Born at Dundee, March 27, 1855, he was educated at the high school and at Edinburgh university. Until 1878 he assisted Lord Kelvin, and during 1878-83 was professor of mechanical engineering at the Imperial university of Tokyo, where he studied earthquakes. During 1883-90 Ewing was professor of engineering at University College, Dundee; and of mechanism and applied mechanics at Cambridge, 1890-1903. He became a member of the ordinance research board in 1906, having been since 1903 director of naval education. In 1916 he became principal and vice-chancellor of Edinburgh university, resigning 1929. Among his important inventions were: magnetic curve-tracer, hysteresis tester, and a permeability bridge, all used in testing the iron employed in making dynamos and transformers. He was knighted in 1911, and died Jan. 7, 1935.

**Ewing**, JULIANA HORATIA (1841-85). British writer of stories for children. She was the daughter



Juliana H. Ewing,  
British author

of Alfred Gatty, vicar of Ecclesfield, Yorks, and the wife of Major Alexander Ewing. Among the pleasantest of her tales are *The Land of Lost Toys*, 1869; *A Flat Iron for a Farthing*, 1873; *Jackanapes*, 1884; and *The Story of a Short Life*, 1885. She died May 13, 1885.

**Ewins**, ARTHUR JAMES (b. 1882). British chemist. Born Feb. 3, 1882, he was educated at Alleyn's school and London university. In 1899 he entered the Wellcome physiological laboratories as assistant. Research chemist in 1917 to May and Baker,

Ltd., he later became director of research, and in 1932 discovered with Dr. M. Phillips the drug M. and B. 693.

**Examination**. Method of discovering the qualifications in certain stated respects of persons submitting to it. Examinations may be designed to test personal qualities or knowledge or skill or understanding. In some form they are, and will probably always be, an important part of the procedure of social selection. In 20th century education, examinations of a more or less formal character affect considerably the type of school the individual attends, the type of instruction he receives there, the record with which he leaves school, his eligibility for various forms of further education, his right to follow a particular occupation, his success in applications for employment, or his eligibility for promotion. One of the commonest forms of examination is the competitive interview. It is also one of the most difficult to systematise and to make objective and reliable as a means of measurement.

Practical men throughout the ages have in their own way assessed the qualities and suitability of prospective employees. Formal methods of examination developed first at the universities, in order to judge the relative attainments of scholars and their fitness to teach and later to practise one of the learned professions. But as the title "senior wrangler" (Cambridge university) indicates, the examination originally took the form of disputation, the candidate having publicly to answer questions and to argue and maintain a thesis against the cross-questions of the examiners. Subsequently, questions were dictated to supplement the oral questions and answers, but there is no record of any written examination questions in Europe earlier than the 18th century. In the 20th printed question papers are in many cases supplemented by oral, or *viva voce*, examinations. More often, however, the examination is conducted wholly by printed question papers, and the candidate's written answers are the only link between the examiner and the candidate, the sole data by which the examiner judges. This fact has given rise to widespread criticism of the examination system.

It is argued:

(a) That a candidate's performance in such an examination is dependent too much on his



physical condition at the time, particularly his nervous condition, and on his command of words; further, on the accident of the examiner's choice of questions, which cannot exhaustively test an elaborate syllabus;

(b) That in any case the examination shows only whether the candidate knew certain things at a certain time, and does not reveal whether or not the knowledge or the skill manifested is permanent;

(c) That examination syllabuses encourage teachers to become "crammers" and to concentrate rather on imparting facts that may be useful in the examination room than on developing the pupil's capacity to use his mother-wit; and that, in particular, in the grammar schools of the country the requirements of examination syllabuses dominate the work of the school and stunt the wider mental and aesthetic development of the pupils;

(d) That the normal examination paper cannot provide an objective measurement of the candidate's performance, the marks awarded being to a large extent a reflection of the idiosyncrasies of the examiner.

Many committees have considered and reported on the examination system, and proposed, for example:

(a) That the results of written examinations should be only supplementary to the student's educational record;

(b) That examination papers should consist of a great number of short questions (say 100 or more), each of which can be answered correctly in only one way, so that the examiner's predilections have no scope and the whole syllabus of study can be reasonably covered by the questions set;

(c) That the leaving certificate examinations of secondary schools should be completely divorced from the examinations for university entrance (matriculation), and should be conducted wholly by the school and the teachers concerned with the students' work, so that the teachers may be free from the constraint of syllabuses imposed from outside.

In 1931 an international inquiry into examinations was organized under the auspices of the Carnegie foundation and the International Institute of Teachers' college, Columbia university. Separate committees investigated examinations in England, France, Germany, Scotland, Switzerland,

and the U.S.A. The English committee published in 1936 a short report, *An Examination of Examinations*. This showed clearly that a large element of chance entered into the results of some important types of examination, such as the school certificate examinations, taken by more than 60,000 pupils annually; the entrance examinations by which about 400,000 children were transferred from the elementary to the secondary school at 10 to 12 years; university college scholarship examinations, and university honours examinations; further, that the conventional type of written examination was by no means a rigid yard-stick; and that methods of examining could be improved. Little change of method developed, however.

Attempts have been made to evolve a technique of examining that would reveal and measure the quality and distinctive characteristics of a person's intelligence and personality, and thus indicate his potentialities and his special aptitudes rather than his current attainments in certain directions. Such methods were used during the Second Great War to classify recruits to the U.S. and British forces, and particularly to select men and women for commissions. The U.K. War Office Selection Board (W.O.S.B.) methods were adopted by some of the larger business houses in the selection of their personnel, particularly those intended for senior executive posts. The National Institute of Industrial Psychology, London, was closely associated with this development.

Intelligence tests, aiming at an assessment of an individual's educability, are a common method of classifying pupils. Tests of mechanical aptitude are often imposed on junior applicants for employment to discover, before they begin training, whether they are likely to develop reasonable skill in special clerical or industrial processes.

See Civil Service; Education; Intelligence Test; Profession; Psychology; School; University. Consult *An English Bibliography of Examinations, 1934*; *An Examination of Examinations, 1936*; *Essays on Examinations, 1936* (all published under the auspices of the International Institute Examination Enquiry); *Aptitudes and Aptitude Testing*, W. V. Bingham, 1937; *Handbook of Commercial and Technical Education*, ed. H. Downs, 1939.

**Examiner of Plays.** British official created in 1737, when the lord chamberlain became responsible for the licensing of plays and appointed an examiner to act as his reader. The statutory authority rests with the lord chamberlain; the examiner has no legal existence. Nevertheless, by the end of the 19th century the examiner had become, in effect, a dictator in the theatre. His opposition to the intellectual revival towards the close of the 19th and at the opening of the 20th century, his banning of plays by Ibsen, Maeterlinck, and Shaw, resulted in the appointment of a select committee of both houses of parliament to consider the question of dramatic censorship. As a result of their report reforms were carried out, the duties of an examiner being henceforth restricted to reading, reporting, and advising on the plays submitted for licence.

**Exarch** (Gr. *exarchos*, leader). In Byzantine history, a title specially applied to the military governor of the district of Ravenna in Italy. The exarch has been compared to the viceroy of India. The direct representative of the emperor, he commanded the troops, controlled the civil administration and finance, and influenced ecclesiastical affairs. The exarchate of Ravenna lasted 584-752.

There was also an exarch of Africa, the earliest mention of whom occurs in 591. The name exarch was also given to a dignitary of the church who held a position below that of the patriarch, but above that of the metropolitan, and to the head of certain monasteries, and survives as the title of the patriarch of Bulgaria.

**Excalibur.** King Arthur's magic sword; called Caliburn and made in the isle of Avalon. In the *Morte d'Arthur* the king takes the sword from the hand of the Lady of the Lake, and learns that its name signifies Cut-Steel, and that while he has the scabbard he can never be sore wounded and cannot lose blood. When stricken down in the final battle, Arthur commands that the sword be thrown into the lake, where it is caught by a hand and vanishes. See *Morte d'Arthur*.

**Excambion.** Term used in Scots law for an exchange of lands. The law allows this to be done in the case of entailed property, as well as unentailed, several statutes to this effect having been passed. It is often done to make boundaries and other divisions of property more convenient.

**Excavator.** Machine for the removal of soil. Except in small jobs or where confined quarters render mechanical excavation impracticable, excavation is done by various types of machine. It is a preliminary operation to building, and involves clearing the site, digging out the foundations, digging trenches for drains, etc. Excavation is also carried out in mining and quarrying: in open-cast mining for coal, for example, the "overburden" (overlying soil) is stripped from the coal deposit by the shovel or drag-line. In quarries, sand pits, and gravel pits and brickworks, the material is dug out with the shovel; the same machine is used for road and railway construction, and the excavation of tunnels. In general the shovel is the appliance for excavation work above ground level.

The shovel comprises the base machinery, with boom, dipper-stick or sticks, and dipper. The last, which is the digging or shovelling member, is attached to the dipper-stick and has a flap bottom door retained by a latch; the door is released to dump the load. Upward and downward movements of the dipper and handle are controlled by the hoist-rope and brake.

The drag-line is used for digging below the ground level on which the machine stands, and operates even if water be present in the workings. Hence its employment for canal and drainage work. There is a wide range of sizes, with capacities of from  $\frac{1}{4}$  cu. yd. to 20 cu. yds., and with boom lengths of 25-225 ft. The boom is usually of lattice steel construction, a bucket being suspended from it by a hoisting rope. A drag-rope passes through a fairlead on the front of the revolving superstructure and is attached to the drag-line bucket.

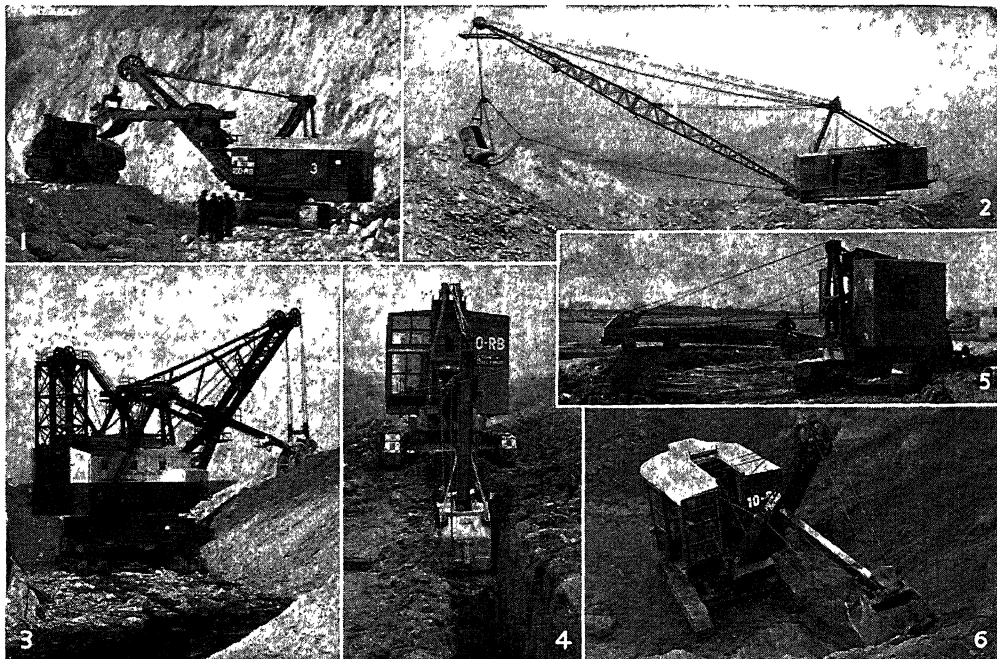
The machine's digging action is obtained by lowering the bucket towards the base of the excavator until it rests on the ground, and pulling it by means of the drag-rope. Teeth on the bottom of the front part of the bucket penetrate and scoop the soil during this action. The load in the bucket is tipped by slacking off the drag-rope; a tipping rope assists this operation.

Where the soil is too heavy to be dug effectively by a drag-line, a drag-shovel is used; it is used also for digging below ground level when the excavation is not too deep. Particularly suitable for trenching work, it has the qualification of the drag-line with

the advantage of the shovel, the dipper being held rigidly to its cut. In principle the machine is a shovel in reverse, except that the dipper-stick is pivoted to the top of the boom, and the dipper is fastened to the end of the stick facing back towards the machine. The drag-shovel can excavate trenches to 25 ft. Skimmers and drag-shovels often have a common boom.

The skimmer takes shallow cuts from the surface. It consists of a box-section boom along which the skimmer-bucket slides in a horizontal direction away from the machine. Its use is limited to shallow excavating. The prising action of the bucket teeth breaks up ground, and the machine can also load the material. During digging, the boom is kept horizontal or at the grade desired, and the bucket is pulled along the boom until full. Then the boom is lifted and rotated to the dumping position required, where the load is discharged by unlatching the pivoted bottom of the bucket. The radius of action is as much as 30 ft. without moving the machine.

The grabbing crane or clamshell is mainly used for handling loose material, though sometimes for excavation. Universal machines



Excavator: appliances used in different situations. 1. Electrically driven 4 cu. yd. quarry shovel. 2. Walking drag-line, much used in canal and drainage work. 3. Thirty-three cu. yd. shovel, one of the largest types of excavator. 4. Drag-shovel excavating a deep trench. 5. Skimmer engaged on levelling work. 6. Half-yard shovel on creeper track.

are excavators (generally not exceeding 1 cu. yard in capacity) which have a common base machine, usually powered by a Diesel engine, and various types of digging equipment. They can readily be converted to shovel, drag-line, drag-shovel, skimmer, grabbing crane, or lifting crane.

The name front-end equipment describes the digging attachment fitted to the base machine to perform various kinds of work. The base machine generally comprises a friction-clutch-operated superstructure with two rope drums, powered by a Diesel engine, petrol engine, or electric motor. Means are provided to rotate the superstructure on the travelling base. Base machines are usually caterpillar-mounted and are extremely mobile.

**SOIL MOVING AND TRANSPORTING.** Soil dug out by excavating machines must usually be removed by ancillary equipment such as dumpers and trucks. In surface work such as road making or the levelling of an area for an airfield, much of the actual trimming and contouring is done by bulldozers, scrapers, and graders. Once the surface soil is loosened by scarifiers which rip up the earth, the latter can be pushed along bodily by a bulldozer: this is a scoop-like shovel fixed at the front of a Diesel-engined tractor-like vehicle, usually on caterpillar track. The soil fills the blade or bowl and the material in front is pushed along as the bulldozer advances. The bulldozer can also push soil to one side of a road being constructed; in an angledozer, the blade is set at an angle to the line of travel of the vehicle, and so thrusts the soil to one side. Soft soil can be dug by these appliances.

The scraper removes soil as it traverses the area. Some forms load the soil into a receptacle as they go; others, like the bulldozer, push some material ahead, and carry more soil in the scoop or pan. The grader is used to form slopes or to shape the crown of a road, etc. In one type the soil moved by the blade is carried to the belt of an elevator forming part of the machine, and is discharged at the side, clear of the roadway, canal bed, etc. Dumpers (*q.v.*) receive material from the excavating shovel or other digging appliance and carry it to the unloading point.

**PUMPING, ETC.** Excavation in permeable ground, where heavy inflows of water are expected, requires special methods. An in-

dependent system of pumping to depress the level of the groundwater is often installed; cylinders and cofferdams are constructed by sheet piling. Compressed air is used in tunnel excavation and where the hydrostatic head does not exceed 100 ft. Other methods include grouting processes whereby the injection of chemicals or cement has the effect of solidifying the ground whilst excavation is in progress. An alternative to compressed air, particularly in shaft sinking is the freezing process, whereby chilled brine is circulated through small tubes lowered into boreholes surrounding the site, and so gradually forms an impermeable membrane in the shape of an ice wall. This process, however, is expensive, and, moreover, a long period elapses before the soil is frozen.

**Excellency.** Title of honour, formerly applied to emperors, kings, princes, and other high personages. In modern British usage it is confined to the governors of dominions, colonies, and Northern Ireland, and ambassadors and envoys. In France and the S. American republics the president is styled Excellency, but not in the U.S.A.; and in Continental countries it is often applied to cabinet ministers. The Italian *eccellenza* is a common mode of addressing strangers.

**Excellent, H.M.S.** Chief school of gunnery for the Royal Navy. It is situated on Whale Island, Portsmouth. Whale Island is largely artificial, having been built up from earth excavated during the construction of Portsmouth dockyard. Officers and men are trained as specialists in all branches of naval artillery.

## EXCHANGE: BASIS OF FOREIGN TRADE

F. A. Willman, Expert in Banking and Currency

*This article describes the essential functions of foreign exchange in international trade, both when free and when under government control. See also Economics; International Monetary Fund; Money; etc*

Exchange (*Lat. ex, out; late Lat. cambiare, to change*) comprises transactions of international finance. Since nations maintain different currencies, every transaction of international trade or finance involves the changing of the purchaser's currency into that of the seller. Thus, if an Englishman buys wheat from Canada, and employs a Canadian lawyer to advise him on some point of law connected with the deal, his pounds must be exchanged into Canadian dollars to pay the farmer for his wheat and the lawyer for his services, since pounds

**Excelsior.** Lyric poem by H. W. Longfellow, published in *Bal-lads and Other Poems*, 1841. It is intended to show the life of a man symbolised in an Alpine climber, resisting all temptations, laying aside fears, heedless of warnings, and pressing right on to accomplish his purpose. After every warning, in the face of every temptation, he repeats *Excelsior, higher*; and then perishes without having reached the perfection he longed for. The voice heard in the air at the close promises immortality and progress ever upward.

**Excess Profits Tax.** Tax introduced by the British government as a war measure in 1939. It was then levied at 60 p.c., but was raised in May, 1940, to 100 p.c. of profits earned by a commercial undertaking in excess of those of a pre-war standard period. The National Defence Contribution was an alternative, the taxpayer being liable for whichever was higher. Between 1940 and the end of the war in 1945, E.P.T. realized over £1,600 millions. The tax was lowered in Dec., 1945, to 60 p.c., and at the end of 1946 it was repealed. In certain cases rebates of 20 p.c. were made to firms wishing to expand their business.

In Sept., 1915, an Excess Profits Duty was imposed by the British government to help meet the cost of the First Great War. Profits in excess of the average made in the years 1912-1914 were dutiable at the rate of 50 p.c., raised to 60 p.c. in 1916 and 80 p.c. in 1918. Duty was not charged on the first £200 of excess profits, and farmers and professional men were exempt. The duty was abolished in March, 1921. *See Taxation.*

are not the currency of Canada. Similarly, if an Englishman receives money from France, the French francs must be changed into pounds before they can be spent in England.

In practice, one currency is exchanged into another by banks, assisted by brokers. Thus, the purchaser of Canadian wheat draws a cheque on his bank in pounds, but the bank pays the Canadian exporter in dollars. To collect a debt due from a Danish importer, an English exporter hands his bank a bill of exchange against which the bank—through

its agent, also a bank, in Copenhagen—collects kroner, which are converted through the banks into pounds.

Exchanges of this kind are possible because banks in every civilized country maintain accounts with banks abroad, such accounts being reckoned in the currency of the country in which they are held. Thus, from its dollar account in Montreal the English bank pays for Canadian wheat, and to its kroner account in Copenhagen the Danish kroner are credited. Banks are, then, both "buyers" and "sellers" of foreign currencies of all kinds, and this side of their business effects the transfer of funds from one country to another and the exchange of the currencies involved. Many thousands of such transactions are conducted daily, and the relationship of one currency to another varies with the trade position of the countries involved.

#### Method of Publishing Exchange Rates

Exchange rates are published daily in the principal newspapers. In Great Britain some (*e.g.* dollars, francs, kroner) are given as so many units of the foreign currency to £1 sterling, others (*e.g.* the Indian rupee and the Chinese dollar) as so many pence, or shillings and pence, to one foreign unit. The only reason for this is custom. Rates may vary from one day to another. The dollar rate, for instance, may be 4.02½ (four dollars two and a half cents) one day and 4.02¾ the next. Again, rates vary according to the time factor. To pay a Canadian exporter by cabled instructions, a bank may quote 4.47 (four dollars forty-seven cents) to £1, which will be the telegraphic transfer (or T.T.) rate, while to pay by post it might quote 4.47½, the mail transfer (or M.T.) rate, ruling at the time.

Exchange rates between countries using the same nominal currency unit are also given; for example, Great Britain, Australia, New Zealand, and S. Africa all use the pound. In these cases the quotation is usually given as the number of Australian (or New Zealand or S. African) pounds which will be paid in Australia (or New Zealand or S. Africa) for £100 paid in London.

Just as the settlement of debts arising from goods sent from one country to another and services rendered by citizens of one country to citizens of another causes a demand for foreign exchange, so do a variety of financial opera-

tions, such as the making of loans and the payment of interest on them, travellers' expenditure abroad, the investment of funds through a foreign stock exchange. Severe changes in the internal price level of a country, by discouraging or stimulating foreign trade, affect the exchange value of its currency; while a government can arbitrarily raise or lower the value of its currency in relation to that of other countries.

The ideal is a stable exchange rate, for changes involve adjustments in price of imports and exports. Frequent changes discourage trade, since manufacturers and other business men can plan ahead with confidence only when they can be sure that exchange rates will remain stable, or very nearly so. Severe and frequent changes in the value in terms of other currencies of the currency unit for a country with considerable international trade leads to world-wide economic chaos.

Before 1914 many nations adhered to the gold standard, under which their currency had a fixed value in terms of gold. There were no restrictions on the export and import of gold, and when a banker was short of any particular foreign exchange he shipped gold abroad, in coins or bars, receiving in exchange its fixed value in the foreign currency he needed. The English gold sovereign contained 20s. worth of gold; the gold in a French louis d'or and an American eagle was equal to the face value of the coin, and so on; one gold sovereign was always worth 4.866 American gold dollars, and the value of the American dollar in London could not move much below that figure, less the cost of shipping and insuring the metal.

#### Breakdown of Gold Standard System

The First Great War broke many delicate international mechanisms, among them the gold standard system of exchange. Gold ceased to be in general use as coin except in some gold-producing countries (*e.g.* S. Africa and the U.S.A., which did not go off the gold standard until 1933). This would not have mattered in itself, since gold is almost as much a token of value as is a pound note or a dollar bill, and the value attached to it is almost as arbitrary; but political upheavals, economic disasters, war destruction, and a general lack of appreciation of the need for stability of exchange led to a period of uncertainty in international financial transactions,

precipitated into chaos by the deliberate devaluation of their own currency by some governments, notably that of the mark by the Germans (to evade payment of reparations).

In an attempt to recreate stability, Great Britain in 1925 returned to the gold standard (though she did not again mint gold coins for her own use); but other countries did not, in many cases could not, follow suit, and she went off gold once more in 1931. The British government then set up an exchange equalisation fund with which the Bank of England "bought" or "sold" foreign currencies abroad when market conditions would otherwise have caused severe exchange rate changes. Other governments adopted a similar expedient.

#### Attempts to Control Exchange Rates

Schemes instituted abroad for the control of foreign exchange dealings in an endeavour to offset the effects of the world depression of the 1930s included clearing agreements, special accounts, and other bi-lateral arrangements which sought to canalise the foreign exchange arising from transactions between two or more countries, and thus to facilitate particular trade relations. Elsewhere, while trade transactions were permitted to pass through the normal exchange channels, those of a capital nature, such as the sale of foreign capital assets, were "blocked," *i.e.* were forcibly retained in the country in which the assets were sold. Even agreements for direct barter were made to reduce the demand upon the available foreign currency.

When the Second Great War began, Great Britain was obliged to concentrate her industry on production for war needs, and was unable to produce anything approaching the quantity of goods she normally sold abroad. In consequence, the supply of new foreign currency becoming due to her was limited, and she introduced strict control of foreign exchange in order to conserve what capital assets she had and what she could earn, particularly in the form of American dollars, for purchases essential to the prosecution of war, thus preventing them being spent on inessentials. Except for dealings within what was termed the sterling area, an area consisting, broadly, of the British Empire (except Canada and Newfoundland) and mandated territories, plus certain countries which for trade or political reasons, elected

to base the value of their currency on the value of the £1 sterling instead of on the dollar, all dealings involving expenditure in foreign currency were subject to licence; while all foreign currency earned by exports or services, accruing from the sale of foreign investments or in any other way, had to be offered to the Bank of England, for which, both as regards expenditure and collection, the ordinary banks acted as agents. This system not only ensured the best use in the national interests of available foreign currency; it also enabled the Bank of England to fix and enforce agreed rates of exchange.

The desirability of stable exchange rates was by this time very widely appreciated, and a United Nations plan, drawn up at Bretton Woods (*q.v.*) in 1944, and accepted by Great Britain in 1945, proposed to stabilise them after the war by the establishment of an International Monetary Fund. See *N.V.*

**Exchange.** Building wherein brokers, merchants, and bankers meet for the transaction of business. Those whose business it is to buy and sell stocks and shares meet at the stock exchange; the principal market place for rubber in London is referred to as the rubber exchange; metals were, until the Second Great War, dealt in at the London metal exchange; while Lloyds remains the principal exchange in the world for the transaction of shipping insurance. Occasionally, as in the Baltic Exchange, the business dealt in is determined by the geographical distribution of the interests involved rather than being confined to a particular commodity. Most English market towns have a corn exchange which is the meeting place of farmers and those who either buy crops or supply such of their needs as fertilisers, seed, and feeding stuffs. See *Stock Exchange*.

**Exchange.** Legal term for the exchange of one piece of land for another by mutual arrangement; or, in ecclesiastical law, the exchange of one living for another by the respective incumbents. The former transaction must be signified by a deed of exchange.

**Exchange Equalisation Fund.** Instituted by the British Government in 1932. Adherence to the gold standard provided foreign exchange dealers with an alternative, at a fixed price, to their normal purchasing or selling of foreign currencies, and thereby restricted

the fluctuations in the rates, or prices, of these currencies. Abandonment of the gold standard left a country with the choice of artificially restricting dealings in its currency, as by requiring all purchases and sales to pass through a central bank on the terms which that bank decides, or providing a fund by means of which operations could be conducted officially in the ordinary market to offset fluctuations arising from abnormal changes in supply and demand. The same fund could be used also to influence rates of exchange in accordance with current government economic policy.

Those were the purposes of the British Exchange Equalisation Fund which was set up to control the foreign value of sterling after the gold standard was abandoned in 1931. Its assets consisted of sterling funds, gold, and foreign currencies; in 1933 they totalled £375 millions. Within four years the authorised limit of the fund was raised to £575 millions to meet the demand upon its services, and on the outbreak of the Second Great War all limitation was removed. To existing assets there was then added some £263 millions of gold hitherto held by the Bank of England for note cover, and thereafter until the introduction of Lease-Lend (*q.v.*) the fund was used mainly as a means of purchasing abroad munitions of war.

**Exchequer.** Name given in England to the department entrusted with the duty of receiving the royal revenues. The word means a chess board because it was by means of a device of this kind that the early accounts were kept. The late Lat. equivalent is *scaccarium*, and the *Dialogus de Scaccario*, a treatise of the time of Henry II, gives most of our existing information about the early exchequer. The sittings were held at Winchester and then at Westminster.

The early kings had both a treasury and an exchequer, and the functions of the two have been somewhat intermingled even until the present day. The *Dialogue* tells how the exchequer met, the justiciar, treasurer, chancellor, and other high officials with their clerks attending its meetings, how the receipts were entered on rolls, and how tallies were used in this connexion. It met twice a year, at Easter and Michaelmas, and its main dealings were with the sheriffs who attended to account for the royal revenues which they had collected or failed to collect. In

addition to this court there was a lower exchequer, which was a permanent department and in practice a branch of the treasury.

Gradually certain changes were introduced. The treasurer took the place of the justiciar as its president, and then these high officials ceased to attend its sittings in person. The seal, hitherto held by the chancellor, was given to a new official, and the chancellor of the exchequer came into being. The chief members were known as barons, and they began to hear cases affecting the revenue, resolving themselves into one of the regular courts of law, the court of exchequer, with a court of appeal, the court of exchequer chamber, which existed from 1357 to 1830.

As the country became richer, the duties of the exchequer grew. It dealt not only with the accounts of the counties, but with others which concerned the royal revenue. The exchequer continued in existence until the 19th century. It collected and paid out the royal income and expenditure, while its five barons, under a chief baron, heard cases as a court of law.

In 1834 great changes were made, the old exchequer being practically abolished, the paymaster-general taking over its duties. A new exchequer was set up, but this was an audit office, and in 1866 the present exchequer and audit department was established. The name exchequer remains in several connexions, exchequer bonds, etc., but the main financial work of the country is done by the treasury, whose actual head, however, is the chancellor of the exchequer, and not the first lord of the treasury. The court of exchequer lasted until the legal reforms of 1876.

Scotland and Ireland had each their exchequer and their court of exchequer on the English model. The union of both kingdoms with England made these separate institutions unnecessary, although the Irish exchequer lasted until 1817, and the Scottish court of exchequer until 1856. See *Chancellor of the Exchequer*; *Treasury*.

**Exchequer and Audit Department.** Government department under the comptroller and auditor-general. His business is to see that all public money is expended in accord with the wishes of parliament. Without his authority no money is paid out of the exchequer. He is also the national auditor, bound to notify any irregularities in his annual report to the house of commons. The office,

established in 1866, took over the duties formerly discharged by the comptroller-general and the commissioners for auditing public accounts. The official can be dismissed only at the request of both houses of parliament. His offices are on Victoria Embankment, London.

**Exchequer Bonds.** British Government security originally issued in 1853 in the form of promissory notes repayable in three to five years. These bonds constituted a common means of government borrowing until after the First Great War, during which issues were made at 3, 5, and 6 p.c. In 1920 an issue was made at 5½ p.c. In 1944, the exchequer bond was revived as a means of raising money for the Second Great War. The rate of interest was, however, 1½ p.c., and the old promissory note form in favour of the bearer was discarded, so that the issue became a government stock in the same way as, for example, war loan, the lender's name appearing on his certificate and the stock being bought and sold on the stock exchange in the usual way. The issue of 1944 was repayable in 1950, but in that year was converted into 2½ p.c. exchequer stock payable in 1955. In 1946 holders of 2½ p.c. Conversion Loan 1944-49 and 2½ p.c. war bonds 1945-47 were offered the right, in lieu of accepting repayment, of converting them into a like amount of 1½ p.c. exchequer bonds.

**Exchequer Grants.** Contributions made by the exchequer annually under the Local Government Act, 1929, to county councils and county boroughs for local government expenses. A general exchequer contribution is made to a central fund and the latter is apportioned among the counties and boroughs. The grant was originally intended to compensate local authorities for the loss of rates suffered through the de-rating of agricultural land and of industrial and freight transport hereditaments—e.g. rlys.—in 1929.

**Excise.** Excise duties are taxes levied on goods produced and, more recently, services rendered, within a country; as distinct from customs duties, which are levied on goods imported. Excise duties were first introduced during the Civil War. The tax on services in the form of an entertainment tax came into being during the First Great War. Purchase tax, a form of excise duty, introduced during the Second Great War, subjected a large range of commodities to

a tax at the time of purchase as distinct from the time of manufacture. The purpose of this tax was twofold. It augmented the revenue, and it also discouraged the demand for goods of all kinds and thus freed labour for more urgent war purposes and restricted private spending.

Included in excise duties are those taxes collected by means of licences, such as the licence required to retail tobacco, wines, spirits, and beer, to practise as an auctioneer, employ male servants, own dogs, etc. The principal sources of excise duty have been spirits, beer, matches, mechanical lighters, licences, British wines, table waters, patent medicines, playing cards, entertainments, and commodities subject to purchase tax. The growth of revenue from excise duties is shown as follows: 1913-14, £39½ millions; 1948-49, £733½ millions.

**Excise Bill.** Measure introduced by Sir Robert Walpole in 1733 for the substitution of an excise instead of a customs duty on wine and tobacco. His object was to lessen smuggling and, by making the ports free, to stimulate a re-export trade. The bill aroused much opposition and was withdrawn.

**Exciter.** Electric generator or dynamo used for supplying current to excite the field magnets of a larger machine. It is used with certain types of direct current machines where it is not practicable to make them self-exciting; also for all alternators. It may be separately driven, but is usually belted or direct-coupled to its main machine; it may reach sizes of 150-200 kilowatts.

An advantage of providing each machine with its own exciter instead of running a group of machines from one house exciter is that control of the main excitation may be carried out by varying the exciter voltage by a resistance in its field circuit, which will have to deal with a very small amount of power. With a common exciter, the control resistance will have to deal with the main machine field current, and large amounts of heat will be generated and have to be dissipated.

Large alternators are frequently fitted with stabilised exciters, the main exciter having its own field supplied by a smaller one. This arrangement prevents surges of current in the main alternator being reflected in the field system and demagnetising or reversing the exciter.

In cinematography an exciter is a small low voltage electric lamp in the sound head of a cine-projector. The light from the lamp passes through the sound track on the film, the varying light falling upon a light-sensitive cell. The varying current produced by the latter, after amplification, is converted into sound by loud speakers.

**Exclusion Bill.** Measure introduced into the English parliament in 1679 for the purpose of excluding James, duke of York, from the throne. The country was greatly excited by Titus Oates's story of a Roman Catholic plot, and the bill was introduced. Mary and William of Orange being named to succeed Charles II. To save his brother, Charles dissolved parliament, but the bill was again brought forward in 1680 and passed by a large majority in the house of commons. The lords rejected it; and a proposal to substitute the duke of Monmouth for James led to its abandonment in 1681.

**Excommunication** (Lat. *ex*, out of; *communis*, common). Term used specifically for the temporary or permanent exclusion of an offending member from the fellowship of the Christian Church. Generally it means exclusion from any organized community. Examples are to be found in the history of the Jews (Lev. 13; Num. 9 and 12; Ezra 10). It existed among Greeks, Romans, and Druids, and has affinity in the tabu of the Polynesian islanders.

The Christian Church claims Scriptural authority for excommunication (Matt. 16 and 18; John 12 and 16; 1 Cor. 5). Imposed first by the community and then by the bishops as a penalty for heresy immorality, or disobedience its primary objects were the bringing of the offender to repentance, and the protection of the Church from corrupting influences. In pagan and Christian usage it has been imposed in degrees of varying severity, ranging from admonition to temporary and partial suspension, and, finally, anathema (*q.v.*).

Gregory VII first claimed the right to depose kings by excommunication, and an ecclesiastical authority could place a whole country under an interdict. Papal claims of this nature led to much trouble in Elizabethan England.

In the Roman Catholic Church excommunication is now governed by the code of canon law, 1918. The Anglican view is represented in Hooker's Ecclesiastical Polity and Canons 65 and 68. At one time in England, after a person



had been under excommunication for 40 days he might, on the issue of a certificate of the diocesan authority to the court of chancery, be imprisoned on a writ of *excommunicato capiendo* until he submitted and was absolved, and the sentence carried with it a number of civil disabilities. By an act of George III, 53, c. 127, it was provided that no person excommunicated could be imprisoned for more than six months and that no civil incapacity should be imposed.

By 54 George III, c. 68, a similar law was enacted for Ireland. Civil penalties were abolished in Scotland in 1690. In Great Britain, though disciplinary jurisdiction of the eccles. courts over the laity exists still, it is subject to statute and common law, and excommunication in the old sense is virtually obsolete. In recent times imprisonment has been imposed only in cases of ritualistic disobedience. In the Scottish Presbyterian churches, lesser excommunication is an affair of the kirk session; the greater excommunication is a prerogative of the presbytery.

Modern cases of excommunication were those of Bishop Colenso (*q.v.*), 1863, whose deposition was negated as invalid by the judicial committee of the privy council in 1865, and of Father George Tyrrell for his criticism of Pius X's encyclical against modernism (*q.v.*) in 1907. Notable excommunications in earlier times were those pronounced by Gregory VII against the emperor Henry IV, 1077; Innocent III against King John of England, 1208-14; Gregory IX against the emperor Frederick II, 1228-45; Julius II against Louis XII of France, 1510; Leo X against Luther, 1521; Paul III against Henry VIII, 1535; and Pius V against Elizabeth, 1570.

**Excursion, THE.** Blank verse poem by William Wordsworth. Published in 1814, it forms the second part of a projected work in three parts entitled *The Recluse*, conceived as a philosophical poem on Man, Nature, and Society. Wordsworth never wrote the third part, but *The Prelude*, an introduction, and the first book of the first part of *The Recluse* were published posthumously in 1850 and 1888 respectively.

**Exe.** River of Devon, England. It rises in Somerset on Exmoor and flows right across Devon, mainly S., to the English Channel, which it enters by a navigable estuary 6 m. long. Exeter stands on it, as does Tiverton, while Exmouth is at the mouth of the estuary. Its

length is 55 m. Its chief tributaries are the Barle and other streams that rise on Exmoor. A ship canal, 5 m. long, connects Exeter with Topsham, from which point the river is navigable. There is some trout fishing in the Exe, which flows mainly through wild and beautiful scenery.

**Execution** (Lat. *exsequi*, to follow out, carry out). Act of performing anything. It is used in law (*v.i.*), and also in other senses, as in executing a commission, or the execution of a piece of music. In a special sense the word has come to mean the carrying out of a death sentence. In England the death penalty was carried out mainly in two ways, by hanging or by beheading. The former was the fate of the ordinary offender. Beheading was reserved for political offenders and persons of rank.

In England the death penalty was in course of time confined to serious crime, and hanging became the only form. Until 1866 executions were carried out in public. In France persons sentenced to death are publicly executed by the guillotine, and in Spain by garroting. Under the Nazi regime, Germany revived execution by beheading with an axe, and this form of capital punishment is carried out in China with the sword. In the majority of states in the U.S.A. execution is by the electric chair, but in some states murderers are asphyxiated in a gas chamber. *See* Capital Punishment; Electrocution; Guillotine.

**Execution.** In English law, term generally used to mean the carrying into effect of the judgment of a competent court. In civil cases this is done by the successful litigant applying to the court for a writ of execution, which as a rule can be had for the asking at an office attached to the court. Some kinds of execution, however, require an order from a judge or judicial officer. Execution is also used for perfecting a legal document by signing, sealing, or delivering it with all proper formalities.

**Executive.** Name given to a body of men who carry out the orders of others. In most modern states there is a distinction between the executive and the legislature; the latter making the laws which the former carry out. Of recent years in England there has been a tendency for the executive to intrude in the field of the legislature. (*See* Cabinet; England; Constitution.)

In the U.S.A. the term executive may refer to a director or leading

official of a business organization; it may also (sometimes with the prefix chief) refer to the president or the governor of one of the 48 states or the mayor of a city. Executive Mansion is the old name for what is now the White House, Washington.

**Executor.** In English law, the person or persons appointed by a will to carry into execution a will as the "legal personal representative" of the deceased. An executor becomes the legal owner of all the deceased's property. His first duty is to arrange for the funeral of the deceased. Then he proves the will, and gets in debts owing to and other property of the deceased. To safeguard himself he should publish advertisements in the London Gazette and in a local newspaper calling for all persons having claims against the deceased to notify them to him. At the end of two months from the advertisement he may distribute the estate, having regard only to the claims notified to him, and will not be personally liable in respect of other claims. In paying the debts he must, if the estate be insolvent, proceed in the order required by the laws of bankruptcy. An executor is entitled to prefer one creditor to another of the same degree, i.e. he may pay one creditor in full even though there are not sufficient assets to pay the other. The executor has also a right to retain out of the estate sufficient to pay any debts which he is owed by it. After payment of debts the executor distributes the estate in accordance with the will of the deceased, but he cannot be compelled to pay any legacies earlier than a year after the death. *See* Will.

**Executory.** Term used in English law in two senses. An executory contract is one which consists of a promise on both sides, e.g. I will make you a chair if you will pay me £10 for it. An executory devise is a gift of land by will, where the estate of the devisee is to arise upon a contingency. Since 1925 executory devises and other executory interests can take effect only as equitable interests.

**Exegesis** (Gr., explanation). Branch of study concerned with the interpretation of Holy Scripture. Properly including all that is connected with the full exposition and understanding of the Bible, it is more commonly restricted to literary interpretation, which determines the sense of the sacred text upon the same principles that would be applied to any other literary work. It differs from Biblical

criticism in taking the text as it stands, and examining its meaning rather than its origin and authenticity. Being concerned not merely with the precise meaning of the text, but with the doctrines and practical inferences to be drawn from it, the study of exegesis is an extensive one.

Exegetes have from early days been divided into two classes: the Literalists took the statements of Holy Scripture in their literal and grammatical meaning; the Allegorists found an inner and spiritual significance underlying the obvious meaning of the text. The N.T. writers afford many examples of the influence of this school. For example, many O.T. passages are applied to Christ which obviously referred originally to contemporaries of the writers. The two schools were long in antagonism, believers in verbal inspiration naturally demanding a literal interpretation of the text of Scripture; while the medieval tendency to read sacramental doctrine into every text of Scripture led to the most far-fetched allegorisation.

The history of exegesis shows a great activity of commentators among both Jews and Christians in the days of the Early Church; but little work was done during the Middle Ages. The allegorical interpretation of a few favourite texts was the subject of most of the books and sermons that could be called exegetical; and collections of patristic comments replaced critical investigation. The Reformation saw a great revival of Bible study, and most of the commentators of this period belonged to the literal school. This may be largely attributed to the need for proving from Scripture the doctrines that were now emphasised, as opposed to accretions to primitive doctrine which owed their existence mainly to allegorical exegesis. See Bible.

**Exelmans**, R  MY JOSEPH ISIDORE, COUNT D' (1775-1852). A French soldier. Born at Bar-le-Duc, Nov. 13, 1775, he joined the Revolutionary armies in 1791, becoming a captain of cavalry in 1799, after his courageous behaviour during the Italian campaigns. On Murat's staff from 1801, he was promoted general after Eylau, 1807, the climax of his active service during the campaigns in Prussia and Poland. Captured in Spain, he was held a prisoner in England 1808-11. He took part in the Russian expedition, 1812, and at Waterloo commanded a cavalry corps. After

the Bourbon restoration he lived in exile until 1823. His high reputation, however, led to his restoration as a peer of France, 1831, and to his elevation to the rank of marshal. He died Nov. 11, 1852.

**Exercise** (Lat. *exercitium*). Movements of the muscles, either voluntary or passive. Voluntary exercise means deliberate movement; passive exercises are movements effected by the manipulation of another person or by a machine. Muscular contraction, such as occurs during steady walking, stimulates the circulation of the blood through the muscles. This, in turn, acts on the heart and respiratory system, causing both to act more vigorously. The formation of more waste products in the tissues makes increased demands upon the excretory system.

Severe exercise is beneficial to the young and healthy, but should not be undertaken by persons beyond middle life or those suffering from cardiac or other serious affections. Heavy muscular effort, long continued, such as that of a blacksmith, tends to produce a thickening of the walls of the arteries, which may eventually lead to heart disease, apoplexy, and other diseases, especially if associated with alcoholism or syphilis. Regular daily exercise is an important part of medical treatment in many conditions, for it is the great sedative of the nervous system. Suitable exercises are of value to strengthen the muscles and correct wrong methods of carrying the body, which may have resulted from weakness or curvature of the spine, and other affections which may follow rickets or malnutrition. Graduated exercises are given in treating pulmonary tuberculosis. In paralysis, specific exercises may educate other nerve tracts to take over the duties of the sick cells.

Passive exercises are mainly employed to prevent wasting of the muscles and stiffening of the joints following sprains or fractures, and to increase the mobility of joints in those suffering from rheumatism or similar conditions. See Physical Training.

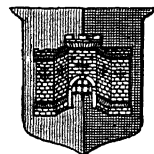
**Exeter**. British cruiser of the County class, sunk by the Japanese on March 1, 1942. Completed in 1931 at a cost of £2,000,000, the Exeter displaced 8,370 tons on a length of 575 ft. and a beam of 58 ft. Geared turbines developed 80,000 h.p. to give a speed of 32.5 knots. She mounted six 8-in. guns in twin turrets, four

4-in. A.A. guns, four 3-pounders, multiple machine-guns, and six torpedo-tubes. She was one of three cruisers which, on Dec. 13, 1939, engaged and chased into Montevideo harbour the German battleship Graf Spee. The Exeter received 40 hits in the action and suffered 100 casualties, but one of her shells destroyed the enemy vessel's fire-control system. (See Plate, Battle of the.)

In 1942 H.M.S. Exeter was with Admiral Doorman's cruiser squadron operating off Java, and in the battle of the Java Sea (*q.v.*) on Feb. 26 was so severely damaged that she had to withdraw for repairs. There was no time to dock her properly, and she sailed with six of her eight boilers out of action. Early in the morning of March 1 two Japanese cruisers were sighted, and a little later two more cruisers and three destroyers came into view. Allied destroyers in escort, H.M.S. Encounter and U.S.S. Pope, attempted to ward off the enemy by launching a torpedo attack, and one Japanese cruiser was hit, but the Exeter received a direct hit in "A" boiler room, which stopped the engines and cut off power throughout the ship. As she lay helpless she was repeatedly hit by Japanese gunfire, until at 11.50 a.m. her commander gave orders to sink and abandon ship. The surviving members of the crew were made prisoners-of-war.

**Exeter**. City, county, parl. and mun. bor., county in itself since 1537, river port, and county town of Devon, England. It stands on the Exe, 171½ m. W.S.W. of London, and has two railway stations. Still partly surrounded by its old walls, it occupies an elevated position on a ridge of land overlooking the Exe.

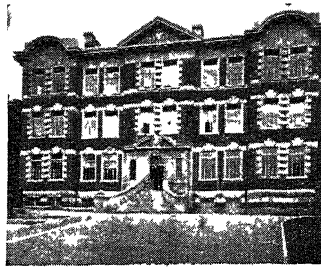
The chief attraction of the city is its comparatively small but magnificent cathedral, with massive Norman transeptal towers (a unique feature except for a copy in the collegiate church at Ottery S. Mary), dating from the 12th century; the remainder of the edifice was transformed between 1280 and 1370 from the Norman to the Decorated style, and a complete restoration was undertaken by Sir G. G. Scott towards the end of the 19th century. Among other interesting buildings are the guildhall, rebuilt in 1330, the episcopal palace, the College of Priest Vicars,



Exeter arms

S. Nicholas Priory, the remains of Rougemont Castle, and Royal Albert memorial museum and art gallery. The city is the seat of a bishop.

The chief educational establishments are the Royal Albert memorial college and Exeter School. The former, which is affiliated to the universities of Oxford and Cambridge, was founded in 1865 as a technical college, and was given the rank of a university college in 1901. The latter, one of the most important public schools in the west of England, was founded in 1629. In 1876 it was reorganized and new buildings were erected: a chapel, gymnasium, laboratory, swimming baths, etc. The old buildings in



Exeter. University College, part of the Albert Memorial

*Damnoniorum*, and the Anglo-Saxon *Exancestre*, Exeter, as the principal fortified town of the W., was frequently besieged by the Danes and other invaders. It capitulated on terms to the Conqueror in 1068, was surrendered in 1136, successfully withstood attacks in 1467, 1497, and 1549. It surrendered to the royalists in 1643, but the parliamentarians were readmitted three years later. In April, 1942, it was subjected to German "Baedeker" air raids, the cathedral and High Street being damaged, and the main building of the city hospital, the library, and several churches destroyed. Post-war excavation of the bombed area brought to view remains of two Roman houses. Exeter is the Chatteris of Thackeray's *Pendennis*, and Exonbury in the Hardy novels. Its motto is *Semper Fidelis*.

**Exeter, MARQUESS AND DUKE OF.** English titles borne by several distinguished families. The first duke was John Holand, a half-brother of Richard II and a descendant of Edward I. The son of

Thomas Holand, earl of Kent, and Joan, afterwards the wife of the Black Prince, he was made a duke in 1397. He had already married a daughter of John of Gaunt, and had been made earl of Huntingdon. One of Richard's chief assistants, he was condemned and executed in Jan., 1400, for conspiring against Henry IV, his titles and estates being forfeited. After Thomas Beaufort, earl of Dorset, had been duke of Exeter from 1416 to 1426, the title returned to the Holands; in 1443 John Holand, a son of the executed John, was made duke of Exeter. His son, Henry, lost his title during the Wars of the Roses.

The title of marquess of Exeter began with the Courtenays. In 1525 it was given to Henry Courtenay, earl of Devon. He was executed in Dec., 1538, his heirs being deprived of his titles. In 1605 Thomas Cecil, Lord Burghley, a son of the great Lord Burghley, was made earl of Exeter. His descendants continued to hold the title, and in 1801 Henry, the 10th earl, was made a marquess. In 1898 William Thomas Brownlow Cecil (b. 1876) became the 5th marquess. The seat is Burghley House and the eldest son is known as Lord Burghley.

**Exeter Book, THE.** MS. collection of Anglo-Saxon poems in the library of Exeter cathedral, to which it was presented in the 11th century by Bishop Leofric. It is clearly written on vellum by one scribe, and forms the most important body of Anglo-Saxon literature that has come down to us. It includes Cynewulf's *Christ*, *The Legend of S. Juliana*, a metrical life of Guthlac, *Widsith*, and *The Wonders of Creation*. It was first printed as *Codex Exoniensis* in 1842, with translations by Benjamin Thorpe.

**Exeter College.** A college of the university of Oxford. Founded in 1314 by Walter de Stapeldon, bishop of Exeter, it was



the High Street were then abandoned, and the school is now outside the city.

As an important rly. centre, Exeter has a floating basin and is connected with the sea by a ship canal (begun in 1564), which extends 5 m. and opens into the estuary near Topsham. Formerly the seat of an active woollen industry, Exeter is an agricultural centre, while brewing, iron-founding, and Honiton lace and paper manufactures are carried on. Market day, Fri. One M.P. is elected. Pop. est. 68,700.

The British *Cuer Isc*, the Roman *Isc*



Exeter, Devon. West front of the cathedral and the 14th-15th century screen ornamented with sculptured figures of Biblical characters. Top, left, pillared façade of the Guildhall, added to the original building in 1598

first called Stapeldon Hall, afterwards Exeter Hall, and then Exeter College, being enlarged by Sir William Petre in 1565. It has always had a special connexion with Devon and Cornwall, and certain scholarships are confined to candidates educated or born in the West country.

Famous men educated here were the first earl of Shaftesbury, R. D. Blackmore, and F. D. Maurice. The buildings face on Turl Street and Broad Street, and their chief feature is the 19th cent. chapel, with decorations by Burne-Jones and William Morris, both members of the college. The hall is notable and there is a small but beautiful garden. The head is called the rector.

**Exeter Hall.** Former public building in London, on the site now occupied by the Strand Palace Hotel. Built in 1831 on land belonging at one time to the marquess of Exeter, it was first the headquarters of the Sacred Harmonic Society, where most of the great singers of the time, including Jenny Lind, appeared. It later became known as the place where the annual meetings of many religious bodies were held. In 1880 it was acquired by the Y.M.C.A., which occupied it until 1907. The hall held 5,000 people.

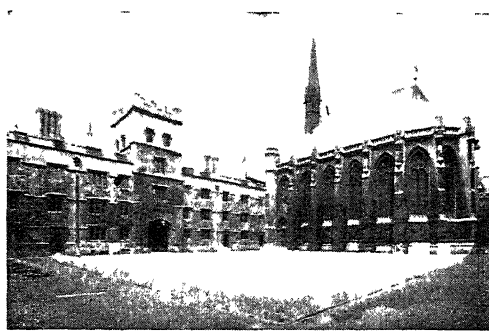
**Exfoliation.** A form of rock weathering in which the outer surfaces of the rock spall off in flakes or skins, so producing a rounded dome-like shape in boulders or outcrops. It may be the result of alternate heating and cooling of the rock surface by day and night, but experiments do not support this theory. Alternatively, it may be caused by the expansion of rock-forming minerals as they begin to decompose because of chemical combination with percolating rain-water.

**Exhaust** (Lat. *ex*, from, out; *haurire*, to draw). The stream of burnt gases ejected from an engine; or the exhaust piping itself. In the internal combustion engine the waste gases after combustion are expelled through the exhaust valve and the exhaust port into the exhaust pipe at the exhaust stroke of the piston.

**Exhibit.** In law, an article or document shown to a witness or a person making an affidavit and identified by him as being an article or document referred to in

his evidence or affidavit. The exhibit is then usually numbered; if an exhibit to an affidavit it is marked by the commissioner for oaths before whom the affidavit is sworn. The commissioner's fee is 1s. 4d. for marking each exhibit.

**Exhibition** (Lat. *ex*, out; *habere*, to have). Term used for a display or show of any kind. Thus there are exhibitions of pictures and other works of art, e.g. the summer exhibition of the Royal Academy at Burlington House, London. In a special sense the



Exeter College, Oxford. The front quadrangle, showing the fine Gothic chapel  
*Hills & Saunders*

word is used for displays of manufactured goods, and national and international exhibitions of this kind were organized on an enormous scale during the 19th and 20th centuries. These are known to the French as *expositions*. In a sense they are the modern equivalent of the great medieval fairs, although the idea is not so much to sell goods directly as to make them known.

Several exhibitions were held in Paris in the time of Napoleon; the practice of awarding medals was then introduced. Others followed—Great Britain, Germany, and other European countries, the British Empire and the U.S.A. borrowing the idea from France. Some of them were confined to a single industry, and to the products of the home country, but others were wider in their scope. Paris remained the centre of this form of activity, but exhibitions were held in London (1828), Manchester (1837), Leeds (1839), and Birmingham (1849).

The modern international exhibition is regarded as dating from the great exhibition of 1851, in Hyde Park, London. The Crystal Palace was built to accommodate the exhibits, and it was a great success. It was visited by over 6,000,000 people, and from the fund money was set aside for

scholarships—1851 exhibitions they are called—and for other purposes. Other international exhibitions followed: New York (1853); Paris (1855); London (1862); Dublin (1865); Paris (1867); Vienna (1873); Philadelphia (1876); Paris (1878); The Hague (1888); Glasgow (1888). In 1889 a great exhibition was held in Paris, the Eiffel Tower being erected for it. In 1893 there was one at Chicago. Glasgow had another in 1901. The Paris exhibition of 1900 was the largest till then held in Europe, and in 1904 that at St. Louis again created a record for size. In 1901 a Pan-American exhibition was held at Buffalo, and others were held at Liège (1905), Brussels (1910), Turin (1911), and Ghent (1913). Before the First Great War, beginning with the Franco-British

exhibition of 1908, London staged a series of exhibitions at Shepherd's Bush and Earl's Court.

The British Empire exhibition (*q.v.*) at Wembley, 1924 and 1925, was the biggest post-war display, and there was an exhibition in Bellahouston Park, Glasgow, in 1938. Paris was the scene in 1937 of an international exhibition of arts and crafts, Chicago in 1933, and New York in 1939 of a World's Fair. In Great Britain the practice has grown up of holding annual exhibitions devoted to individual trades or purposes; e.g. the British Industries Fair, Motor Show, Ideal Homes, Radiolympia, Book Fair. See Festival of Britain, in N.V.

**Exhibitionism.** A term used by psychologists for behaviour designed to attract attention. It includes the wearing of bizarre clothes and loud and continuous talking; appears in the "naughtiness" of neglected children; and is occasionally seen in actors, writers, and politicians. In Freudian psychology it is particularly applied to the male perversion which consists in taking sexual pleasure in being looked at. This is an inversion of voyeurism, *i.e.* the desire to look at the object of sexual pleasure.

**Exhumation** (Lat. *ex*, out of; *humus*, ground). Act of digging up and removing any object from the

ground, but generally applied to the removal of a dead body from its burial place. It is a misdemeanour to do this for any purpose without legal authority. In England such authority may be the Home secretary or coroner where foul play may reasonably be suspected, and the ordinary (*q.v.*) of the diocese when reinterment is the reason. See Autopsy; Burial Acts.

**Exile** (Lat. *exsilium*). Removal from one's native land, either voluntarily or under compulsion. The word probably means "leaping forth," from the root *sal-*, which occurs in *con-sul* and *Salii*, the leaping priests of Mars.

In Greece, exile was chiefly a punishment in cases of homicide, but was also enforced for certain crimes and offences against the state and society. Homicides could anticipate their sentence by voluntary withdrawal, but were liable to be put to death if they returned. Exile was also a political measure employed in troublous times. It carried with it disfranchisement and confiscation of property. A peculiar method of banishment was ostracism (*q.v.*).

At Rome, exile did not become a recognized form of punishment until about the time of the Gracchi. Theoretically, a citizen's life and liberty were inviolable, so the fiction of *aquae et ignis interdictio*, exclusion from the use of fire and water, was invented, since anyone deprived of these necessities in Rome would perforce have to seek a home elsewhere, it being an offence for anyone to supply them to a person under the ban. It is uncertain whether *interdictio* involved loss of civil rights and confiscation. The sentence was at first pronounced by the *comitia centuriata*, and later by the *quaestiones perpetuae*, the standing courts which dealt with serious offences, such as high treason, poisoning, and arson. Anyone could voluntarily leave the city, but was forbidden to return under pain of death.

In early imperial times, *deportatio* took the place of *interdictio*. The condemned person was compelled to take up his abode for life in some place out of Italy, or on some island. He was sometimes allowed to choose the place of exile himself, but generally it was assigned to him. Deportation entailed loss of civil rights and confiscation.

A milder form of banishment was *relegatio*, temporary or for life, pronounced by a higher magistrate or the emperor against any person whose presence in the city was considered undesirable. It entailed

neither loss of civil rights nor confiscation, as is expressly stated by the poet Ovid, who was exiled by Augustus to Tomi on the Black Sea for some unknown offence. See Displaced Person; Outlawry; Refugee; Transportation.

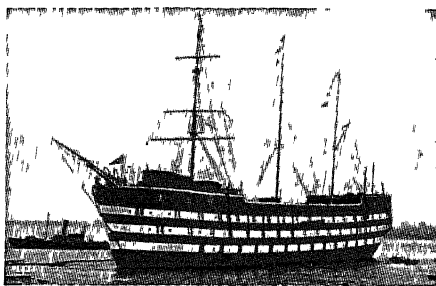
**Existentialism.** Philosophy of existence, primarily concerned with the nature and experience of the individual. Preoccupied with the nature of being or essence, with individual human consciousness coming into a world of existences, and, above all, with action, it derived in part from Kirkegaard. This philosopher, an opponent of Hegel, declared that "every man is primitively planned to be a self . . . Truth is subjective" (by which is implied that thinking is not handling propositions but living, that thought is not a proposition, but a man thinking). His dictum "choose, leap, and be free," was interpreted by the existentialist philosophers, Heidegger and Jaspers, in the light of anihilistic doctrine.

Shortly before and during the Second Great War, existentialism gave rise to a French school of philosophers, dramatists, and novelists, of whom the more sensational were Jean Paul Sartre (*q.v.*) and Albert Camus. The atheistic philosophy exemplified in Sartre's *Huis Clos*, or Camus's *L'Étranger*, aroused considerable controversy, not only in France, but in Scandinavia, Great Britain, and the U.S.A. Such works were directly concerned with the problem of man's relations with himself and with others, and received a special hearing at a time when many human beings, often in complete isolation, had to make momentous decisions. Consult Existentialism, G. de Ruggiero, 1947.

**Ex Libris** (Lat., from books). Label of ownership usually called in England a bookplate (*q.v.*). Pasted inside the front cover of a book, it bears the name and device of the owner, preceded by the words *Ex Libris*. This Latin appellation is incorporated in the titles of societies devoted to the study of book plates.

**Exmoor.** Picturesque and elevated moorland expanse in Somerset and Devon, England. Formerly a forest with an area of about 20,000 acres, its trees have largely disappeared, and three-fourths of it are now covered with heather

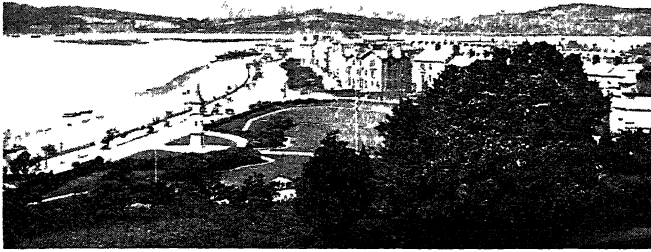
and a coarse grass, on which are pastured ponies, sheep, and red deer, the last preserved for stag-hunting. In 1917 Sir Thomas Acland granted a lease of lands covering between 7,000 and 8,000 acres to the National Trust for 500 years, and in 1943 Sir Richard Acland made over the land outright; this area includes some of the finest hill, valley, and woodland scenery of Exmoor. Lorna Doone, Blackmore's romance, has made Exmoor familiar. The river Exe takes its rise here. Other streams are the Barle and the Lyn, and all are fished for trout. The highest point is Dunkery Beacon, 1,707 ft., in the centre. To the S.W. is Span Head, 1,618 ft. Consult Wild Exmoor Through the Year, E. W. Hendy, 1946.



Exmouth. Training ship for boys for R.N. and M.N. In 1948 it was renamed Worcester

**Exmouth.** Former name of a training ship for boys for the Royal Navy and merchant navy, built in 1876, and moored off Grays, Essex. In 1941 she was taken over by the Royal Navy and moved to Scapa Flow as an accommodation vessel; the training school was transferred to Bray Court, near Maidenhead. In 1946 the Exmouth was refitted as a training ship, and in 1948 renamed Worcester (*q.v.*) to take the place of the ship of that name belonging to the Incorporated Thames Nautical Training College.

**Exmouth.** Urban district and watering place of S. Devon, England. It is on the left bank of the Exe, at its mouth in the English Channel, 10½ m. by Southern rly. S.S.E. of Exeter. The first seaside resort to be developed in the county and still among the most popular, Exmouth is largely resorted to by sufferers from lung complaints. In history it is first mentioned c. 1000 as being in possession of the Danes. Once a flourishing seaport, it contributed ten ships for the attack on Calais in 1347. In the Civil War it sustained a long siege on behalf of Charles I. Besides fishing, brick



Exmouth, Devon. View from the east looking along the promenade and sands towards the mouth of the Exe and the hills beyond it

making is an industry, and all sports associated with a seaside holiday are catered for. Pop. est. 18,000.

**Exmouth**, EDWARD PELLEW, 1ST VISCOUNT (1757-1833). British sailor. He was born at Dover, April 19, 1757, and entered the navy at 13. In 1776 by his gallantry at Lake Champlain (*q.v.*) he secured his promotion to lieutenant. In 1793 he was appointed to the frigate *Nymph*. For his capture of the *Cléopâtre* he was knighted in 1793, and in 1804 he was promoted rear-admiral and commander-in-chief in India. Returning to England in 1809, he became commander-in-chief of the North Sea, 1810, and of the Mediterranean station, 1811. In 1814 he was raised to the peerage. In 1816, on the refusal of the dey of Algiers to cease his piracies, Exmouth was sent to bombard that city, with the result that over 2,000 slaves were liberated. Made viscount in that year, he died Jan. 23, 1833. The title is still held by his descendants, Edward (b. 1868) becoming 8th viscount on succeeding a cousin in 1945. A Life of the 1st viscount by C. N. Parkinson appeared in 1934.



*Exmouth*  
After W. Owen, R. A

**Exmouth Gulf**. Inlet of the W. coast of Australia. It penetrates inland about 65 m., and at its entrance is 30 m. across. It is sheltered from the Indian Ocean by a peninsula 80 m. in length, which terminates in the North West Cape.

**Exodus**. The second book of the Pentateuch, or rather Hexateuch. The title, taken from the Septuagint (Ex. 19), means the "Going-forth." The Hebrew title

is "Names" or "And these are the Names." The book falls into two main divisions: (a) history of Israel in Egypt, chaps. 1-18; (b) account of Moses' administration at Sinai, whither he had led the children of Israel, chaps. 19-40. The former section incorporates a much earlier composition, the Song of the Red Sea (chap. 15). The latter includes one of the three chief Hebrew codes of law (beginning chap. 20, v. 22), described as the Book of the Covenant. Chap. 20 contains the ten commandments. See Hexateuch.

**Exogamy** (Gr. *exō*, outside; *gamos*, marriage). Primitive institution binding a man to marry outside his own social group. Its primal impulse was probably economic rather than eugenic. In those societies wherein the family is overshadowed by the kinship group, the exogamous clan is often associated with a totem, a mystical token of kinship. Highly developed among the Australian aborigines, it is usual among the N. Mongols, and widespread with the American Indians. Arising from it are such marriage customs as marriage by capture. A special form called hypergamy existed in some Hindu castes; it required a woman to marry into a caste higher than her own. See Marriage; Society.

**Exophagy** (Gr. *exō*, outside; *phagēin*, to eat). The practice among some cannibal peoples of seeking their human food outside their own kin, totem, or tribe. The contrary usage is endophagy. The words are loosely employed by different writers; endocannibalism and exocannibalism might usefully be reserved for the man-eating of totemic tribes, exophagy for extra-tribal cannibalism (*q.v.*).

**Exophthalmic Goitre**, OR GRAVE'S OR BASEDOW'S DISEASE. Condition due to excessive or disordered secretion of the thyroid gland, the important ductless

gland situated in front of the lower part of the neck. Strong emotion such as fright, worry, or grief may be an antecedent factor, and the lighting up of a septic focus seems in some cases to be a trigger cause, though the essential underlying cause is still unknown. The disease is much more common in women than in men because strain is thrown on the thyroid in menstruation and in pregnancy, and its incidence rises with civilization. A palpitation of the heart and throbbing of the large blood vessels in the neck with a pulse rate of 100-200 beats per minute; exophthalmos, or protrusion of the eyeballs; fine tremor of the muscles of the lower and upper limbs; these are the classical signs of the disease. Emotional change and disbalance are distressing features.

Treatment consists in rest, freedom from worry, and the giving of iodine, but the essential cure is surgical removal of a large part of the gland, enough being left to carry on its normal function.

**Exophthalmos**. (Gr. *ex*, out; *ophthalmos*, eye). Condition of prominence of the eyeballs, or of apparent prominence of them caused by retraction of the eyelids. It is associated with exophthalmic goitre, hyperthyroidism, and other less common physical conditions. Exophthalmos, once established, tends to persist.

**Exorcism** (Gr. *ex*, out; *horkizein*, to adjure). The expulsion of malign spirits by ritual means. Belief in demon possession and demon obsession is revealed in early Sumerian inscriptions. The Semitic Babylonians regarded most mental and bodily ailments as due to intrusive demons, whose expulsion was sought by the incantation of charms containing a divine name, fortified by material aids. Exorcism passed into the Greco-Roman world, was rife in W. Asia in N.T. times, was taken over by early Christianity, and survives here and there in ecclesiastical ritual. Baptismal exorcism is retained by the Roman and Old Lutheran communions.

In primitive culture disease is commonly attributed to evil magic wrought by one person upon another. The intrusive evils, whether human hosts or non-human demons, may haunt persons or places. Preventive exorcism is one chief purpose of the amulet. Expulsion may be attempted by sympathetic magic, such as the Babylonian wasting of a wax effigy of the sorcerer, or the



Dakota shooting of a bark effigy of the demon.

Ills may be driven out by drums, as in Patagonia, or other musical means, as in the story of David and Saul; they may be transferred to scape-animals, such as fowls, as in W. Africa; to goats, as in Arabia; or to swine (Matt. 8). They may be enclosed in a receptacle left by the roadside, or thrown into the stream, as in Uganda; conjured into a proa, driven out to sea, as in the Malay archipelago; or attached to a rag or wisp of hair suspended from a tree. An appeal or command addressed to the demon may be fortified by a promised sacrifice or a vow. *See Demonology*; consult also *The Golden Bough*, J. G. Frazer, new ed. 1922.

**Exoskeleton.** Zoological term for the hard structures produced by modification of some or all parts of the integuments of animals. It acts as a support or a protection or both for the softer organs within, and to it muscles may be attached. Examples are among the Arthropoda, e.g. crabs, lobsters, spiders, and insects. Less obvious examples are the scales of reptiles and fishes, the feathers of birds, and the fur of mammals.

**Expansion** (Lat. *ex*, from, out; *pandere*, to spread). Increase in the dimensions of a body. It may result from a change of temperature or state. The recognized coefficients of thermal expansion are (a) linear, defined as change in length per unit length per degree rise in temperature; (b) areal or superficial, defined as the change in area per unit area per degree rise in temperature; and (c) volume or cubical, defined as the change in volume per unit volume per degree rise in temperature. The linear and areal coefficients are applicable only to solids and for an isotropic material are approximately one-third and one-half respectively of the volume coefficient. In some substances, e.g. crystals, the value of the linear coefficient will differ in different directions. The magnitude of expansion for a solid is quite small; an iron bar one metre in length will expand by approximately one millimetre when heated from 0° C. to 100° C. Typical values of linear thermal expansion coefficients (per degree C.) are as follows:—

Platinum ..	0.0000089
Copper ..	0.0000168
Zinc ..	0.0000292
Glass ..	0.0000083
Quartz (crystal)	
axis ..	0.0000075
⊥ axis ..	0.0000137

The fact that platinum and certain kinds of glass have almost identical coefficients allows the making of airtight seals of platinum wire in glass. "Invar," a patent nickel-steel with an expansion coefficient of the order of 0.000001, is used in clock pendulums.

Liquids and gases have to be contained in vessels which also expand, and so what is directly observed when fluids are heated is the apparent expansion. The apparent does not differ appreciably from the true expansion in gases, whose expansion (cubical) coefficient is much larger than that of solids. The mean coefficient of volume expansion of mercury between 0° C. and 100° C. is 0.000182. Water decreases in volume between 0° C. and 4° C., when its density is a maximum; thereafter it expands until it changes state at boiling point.

Another physical condition to modify the size of a body is the application of a magnetic field. With nickel a marked decrease in length is shown, and the phenomenon, known as magnetostriction, is applied to the construction of mechanical oscillators.

**Expansion of the Universe.** The extragalactic nebulae are found to be receding from the sun at speeds which increase proportionally to their distances. The universe thus seems to be expanding at a rate which doubles all distances in about 1,300 million years. This fact suggests that the universe may once have been confined to a relatively small volume of space, the separate galaxies moving at different speeds which have in the course of time carried the fastest-moving ones farthest away. The equations of the general theory of relativity have various possible solutions, some of which correspond to an expansion of space itself which may be the cause of the observed recession of the nebulae.

**Ex parte** (Lat., from one side). Expression used in English law to signify something done or said by one person not in the presence of his opponent. Thus an *ex parte* application is one made in the absence of the other side. An *ex parte* statement is one made when no one present can contradict it.

**Expectant.** Term used in English law. An expectant estate is one that comes into possession and enjoyment when some date arrives or event happens. Reversions and remainders are the only expectant estates known to common law; but when wills of land were allowed the law permitted executory interests.

An expectant heir is one who is bound to come into property on the death of another.

**Expectation of Life.** Term used by actuaries and others engaged in life insurance business for the number of years a person may be expected to live. By careful calculations tables have been worked out which are used when annuities are bought and sold. The expectation differs for males and females, and for different ages, but a roughly accurate method is to value the expectation of life at two thirds of the difference between the present age and 80. Thus a man of 41 may count upon living to 67, this being 26 more years, two-thirds of 39, which is the difference between 41 and 80. Some writers have objected to the term, and equation of life has been suggested as a substitute. *See Annuity*; *Death Rate*; *Insurance*.

**Expectorant** (Lat. *ex*, out; stem, *pector*-, breast). Drug which assists the expulsion of mucus from the lungs and air passages. Such drugs include ammonium carbonate, senega, squills, ipecacuanha, benzoin, and balsam of tolu.

**Expeditionary Force.** Military formation sent overseas from its home bases for operations in foreign territory. After the British army was reorganized in 1900, an expeditionary force of regular troops was trained and held in readiness for immediate service abroad. The force consisted of six divisions of infantry, one division of cavalry, and ancillary troops, totalling some 140,000 men. This was the British Expeditionary Force (*q.v.*) that landed in France in Aug.-Sept., 1914. Throughout the First Great War, the term was applied to any important military force sent out to a separate theatre of war under an independent commander. Thus the Mediterranean Expeditionary Force fought in Gallipoli, Salonica, and Egypt, the Italy Expeditionary Force was sent to the assistance of Italy, and the Archangel Expeditionary Force assisted the White Russians in the war against the Bolsheviks. The U.S. troops in France in 1918 were known as the American Expeditionary Force.

The peace-time organization of a British Expeditionary Force was altered by including in it a Territorial Army Field Force. In Sept., 1939, an expeditionary force of some 150,000 regular and territorial troops, later expanded to nearly 350,000 men, crossed to the Continent. The N.W. Europe Expeditionary Force, consisting mostly

of young militiamen, went to Norway in April, 1940. The British 9th army based in Syria, Iraq, and Palestine was known as the Mediterranean Expeditionary Force, while the Anglo-American troops invading Normandy in 1944 were called the Allied Expeditionary Force (*q.v.*). But during the Second Great War the term expeditionary force was less widely used, other designations being favoured, *e.g.* Balkan Land Force, South-East Asia Command.

**Expenditure** (Lat. *ex*, out; *pendere*, to weigh). Act of paying out money. In large firms expenditure passes through the counting-house and is checked by the auditors. National expenditure is voted by the house of commons, and the expenditure of local authorities, which is under the control of finance committees and officials acting under their orders, is checked by auditors of the appropriate government department. *See* Accountancy.

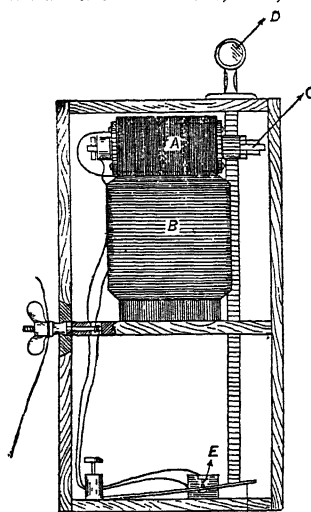
**Experience** (Lat. *experiri*, to try). The effect upon organisms of interaction with their environments as it is interpreted by their minds. Both Plato (Republic) and Kant (Critique of Pure Reason) realized that subjective factors colour experience of the external world, but Plato exaggerated their effect upon the validity of sense knowledge, and Kant limited them to certain categories—*e.g.* cause and effect—and failed to realize the part played by such factors as instinct and emotion. Every experience modifies the attitude of the mind to subsequent stimuli, especially those of the same nature. The extreme case is the violent shock which renders a person insane.

Evolution in the animal kingdom is accompanied by an increase in the power of learning from experience. This power is almost absent in insects, but it has developed in man until he is a being possessed of reason—able by comparing, contrasting, and evaluating experiences, and drawing correct deductions from them, to arrive at accurate knowledge. One of the most important recent psychological discoveries is that all experience is stored in the unconscious mind and that much of it, in appropriate circumstances, influences subsequent conduct without there being awareness of it. *See* Unconscious.

**Experiment.** Testing a provisionally adopted theory by facts. The great progress of natural science in modern times has been

chiefly due to the systematic employment of experiment. Ancient philosophers and inquirers had a contempt for this method, which first received due recognition by Francis Bacon in his *Novum Organum*, 1620. An experiment may be defined as an observation which can be repeated, varied, and explained.

**Experimental Farm.** Farm at which soils, crops, the science of manuring, and other subjects cognate to agriculture are studied and from which the results of investigations are issued for the guidance of farmers. An example is Rothamsted, Herts, which was founded by Sir John Lawes in 1843 and still operates in a greatly extended form. Woburn, Beds, was



Exploder. Sectional diagram of magneto exploder. For explanation of lettering, see text

established by the Royal Agricultural Society, and later stations such as Aberystwyth, Cambridge, Corstorphine, Glasnevin, and Stormont were brought into being for the study and improvement of crop plants. East Malling and Long Ashton have made a special study of the problems of fruit growing. The National Institute of Agricultural Botany, Cambridge, was established 1919 to determine the comparative value of crop plants on a geographical basis. In the British dominions and in all foreign countries whose agriculture is sufficiently organized, experimental farms have been set up. *See* Agricultural Bureaux.

**Expert** (Lat. *expertus*, tried). In English law, the term used to describe one who has special skill in and knowledge of a trade or profession. Experts are often

called to give their opinions in technical cases.

**Exploder.** Term designating the electric machine for firing blasting charges fitted with electric detonators. Exploders occasionally utilise current from a set of accumulators passed through an induction coil, but the more usual machines are of the magneto type, a sectional illustration of such a machine being shown. It consists essentially of a double-wound armature, A, which can be rotated between the poles of the horseshoe magnet, B, through the free wheel pinion, C, which is actuated by the rack, having a hand grip, D, at its upper end. The free wheel ensures that the armature does not rotate as the handle is pulled up, but only when it is pushed down and the current is normally short-circuited by the switch, E. When the rack reaches the bottom of its stroke, and the armature is revolving at maximum speed, the rack opens switch E and the whole of the current passes to the main leads secured by the wing-nuts shown on the left, and thus to the detonators. A machine of this type weighs some 16 lb., and can fire simultaneously up to 100 charges.

**Exploitation** (old Fr. *exploit*, profit). Stage in the life of a mine when ore is extracted and sold, the previous stages being prospecting and development. During the earlier periods the money expended is regarded as capital invested in the business; during exploitation the revenue from sales is regarded partly as return of the capital expended and the interest thereon. *See* Mining; Prospecting.

**Exploits.** River of Newfoundland. The longest river in the island, it rises in the hills of Long Range and flows right across in a N.E. direction. It passes through a well-wooded district which supplies timber for the pulp mills, and on it is the town of Grand Falls. It empties itself into the Bay of Exploits, having drained about 4,000 sq. m. Its length is about 160 m., and it is navigable by steamers for 12 m.

**Exploration** (Lat. *explorare*, to search out). Literally, any kind of discovery, but the word is applied specially to discovering and making known the hitherto unknown parts of the world. There was little in the way of exploration from the time of the Greeks to almost the end of the Middle Ages.

In the 13th century something became known about China, and

Marco Polo may fairly be ranked as a pioneer of exploration. It was, however, towards the end of the 15th century that the great discoveries were made that gave a remarkable impetus to the work of the explorer. In 1492 Columbus reached the W. Indies; in 1497 Vasco da Gama rounded the Cape of Good Hope, and reached India; while about those years notable voyages were undertaken by Bartholomew Diaz, the Cabots, and others. Newfoundland was discovered; Cabral reached Brazil; Balboa saw the Pacific. From these discoveries followed the exploration of America. In the N. the lead was taken by Frenchmen, La Salle being one of the greatest names, and in the S. by the Spaniards and Portuguese. Gradually the nature and extent of the two continents were made known; the Amazon and the Mississippi were discovered and then explored, while the secrets of the wonderful Aztec civilization were revealed.

In the 18th century Australia was discovered by Captain Cook, although the Dutch Tasman had some time before found Tasmania and New Zealand. Early in the 19th century the continent was explored by Oxley, Sturt, Eyre, and a host of others. More and more was becoming known of Asia, although it was long before its central area was explored by Hedin and others, the final stage being the entry into Lhasa, 1904. In the 19th century, too, came the exploration of Africa, the work of Livingstone, Stanley, Hanning, Speke, and others among Englishmen, as well as a number of Frenchmen and Germans. The secrets of the Nile and the Congo were revealed, and soon there was little for the explorer to do.

From the time of the discovery of America, explorers had turned their attention to a north-west or north-east passage, and from this came the desire to reach the North Pole. The South Pole, too, was aimed at, and the exploration of the world's surface may be said to have ended when these goals were reached. See Antarctic Exploration; Arctic Exploration.

**Explosion.** A very rapid chemical reaction accompanied by the liberation of heat and the simultaneous liberation of gaseous products. Combustion, whether of hydrogen, petrol, or coal, is a rapid oxidation reaction, *i.e.* combustion takes place by reaction with oxygen which may come from the air or be supplied by an oxygen carrier such as sodium nitrate in

gunpowder. The high temperature produced in these reactions usually gives rise to luminosity or flame. Explosions are not always oxidation reactions; simple substances, liquid, solid, or gaseous, not containing oxygen (*e.g.* acetylene, lead azide) may explode spontaneously when suitably set off.

In certain circumstances, dust may be a contributory cause of an explosion, particularly in mills, grain elevators, or coal mines. Though not explosive in itself, coal or flour dust is highly inflammable, and if it comes into contact with flame, or even a weak electric spark, combustion takes place by reaction with the oxygen in the air. The dust nearest the source of heat is first ignited, and then the flame passes from particle to particle of the dust until it has all been consumed. The explosive force generated by dust is equivalent to that generated by the ignition of petrol vapour.

Explosions are usually the results of chemical changes, but the term is also used in reference to processes of a purely physical nature, such as the explosion of a steam boiler or the bursting of a beer bottle. These effects result solely from the sudden expansion of a high pressure or by volatilisation of liquefied gases.

#### Rate of Combustion

When a gaseous mixture, *e.g.* coal gas and air, or hydrogen and oxygen, is ignited by a hot wire or an electric spark, flame is propagated through the mixture at a uniform rate, which may vary from a few to many hundred centimetres per second. In a closed tube the initial flame speed may accelerate rapidly to a much higher constant velocity of several thousand cms./sec. This is known as detonation.

These factors determining the rates of combustion are important in connexion with the internal combustion engine and other oxidation processes. The motive power of the internal combustion engine is produced by the explosion of a mixture of inflammable hydrocarbon vapour and air in suitable proportion, and the engine's efficiency depends partly on the rate of pressure development in the explosion relative to the speed of running. Ignition of the mixture in the cylinder is produced either by a spark or by rapid compression of fuel (compression ignition). Detonation of the mixture in the cylinder gives rise to the phenomenon of "knocking" or "pinking," and is reduced by the

addition of anti-knock agents, such as lead tetraethyl, to the fuel.

**BLAST.** The destructive effect of an explosion is not restricted to the point of ignition but, owing to blast, may cover a wide area. Blast is produced by the sudden liberation into the atmosphere of gas at high pressure, blankets of air being displaced in various directions from the centre of explosion, with greater or less violence according to the intensity of the explosion. This displacement creates pockets of strong compression and suction, due only indirectly to the gaseous products of the explosion.

#### How Blast Causes Destruction

Blast is transmitted in the form of a wave, its velocity approximating to that of a sound wave in air (1,100 ft. per sec.). This creates a change in the air pressure, and the positive change so created in the normal air pressure is much greater than the negative, as the actual pressure can never fall below zero. Thus blast first creates a pressure wave against any object in its path; then, as the wave is dissipated and the natural atmospheric pressure returns to normal, a partial vacuum is created which acts as a sudden pull against the affected object. Although the suction is weaker than the original pressure, it lasts several times as long, and normally does damage to objects which had not time to weaken under the usually brief initial pressure. Frequently it is the pull that causes destruction. Provided the pressure wave lasts long enough, it will set up vibration in the objects in its path and they will oscillate in sympathy with the following pull when it arrives. In other words, objects and pull will be in resonance, and the former will collapse. Objects built of timber or having many joints have a high frequency of vibration and are more liable to be ruptured by blast than those of low frequency; a solidly built concrete structure has low frequency and is therefore resistant to blast. It is the dual push-and-pull action of blast on obstacles in its path that produces contradictory effects. Some buildings in the blast area may be destroyed by the initial forward movement of the pressure wave and fall before it, while others will collapse under the pull effect in the opposite direction.

Blast generally spreads outwards with a steep incline at the point of initial explosion, but quickly curves back towards the ground.

This explains why objects in the immediate vicinity of impact may be unaffected, while buildings some distance away will collapse.

The intensity of blast of a shell or bomb is governed by five factors: the type of explosive, the size of the projectile, the detonation velocity (*i.e.* the wave motion through the mass of the explosive), the thickness of the bomb or shell casing, and the type of ground upon which the projectile falls. For a given weight and type of explosive, a thin-cased bomb has a greater blast effect than one with a thick case; while any bomb falling on soft ground has a lower blast effect than one making contact with a hard surface, such as concrete or steel. Owing to the enormous pressure generated by an atomic bomb (*q.v.*) explosion, objects in the path of the blast are usually destroyed by the initial pressure wave, so that most objects have already collapsed when the pressure drops and the pull in the opposite direction is exerted.

Animal and human victims of blast are killed either by the concussion of the initial pressure wave or by the pulling effect created by the resultant vacuum. In the latter event the air is extracted from the body; the lungs collapse and the internal organs break up owing to the evacuation of the air supporting their interiors. This causes death, and such victims of blast show no outward sign of injury.

The high pressure wave generated by an explosion striking the Corti organ of the ear gives the impression of a loud sound at the seat of the explosion. Actually, the noise of detonation is not generated by the explosion, but is received by each hearer individually according to the path of the pressure wave. Thus, a person some distance from the explosion may hear a very **loud** noise, whereas another person, closer to the explosion, but shielded by a building or rising ground, receives a much weaker sound impression.

High explosives differ a great deal from one another in their sensitiveness to detonation. Blasting gelatine may be set off by the detonation of a sensitive explosive, placed in close contact with it. Such "initiator explosives" are generally used either alone or in mixtures in detonators. The most important members of this class are mercury fulminate and lead azide. Many high explosives require the interposition between the detonator and the high explosive of a sensitive explosive called an "exploder," "booster," or "gaine."

**HISTORY.** The early history of explosives and their actual invention is a matter of much speculation. Gunpowder is certainly the oldest. It is sometimes connected with "Greek fire," used in the Byzantine period, but it is doubtful whether saltpetre of sufficient purity was known at the time. Saltpetre was known to the Chinese and Arabic people about 1200, and they used it in fireworks for military purposes. Roger Bacon (1214-94) in his writings made undoubted references to gunpowder, using a cipher to conceal instructions for its manufacture, and he was acquainted with the fact that it explodes violently when ignited in confinement. The use of gunpowder for the propulsion of missiles from guns is said to have been introduced by a German monk, Berthold Schwartz. Old manuscripts record different dates for this event; but guns were certainly in use by 1320.

For some six centuries gunpowder remained the only known explosive, and its composition remained almost unchanged, saltpetre, charcoal, and sulphur being the ingredients, in varied proportions. Its progress from an uncertain, irregular medium to a uniform and reliable explosive was due to improved manufacturing methods and greater purity of ingredients, this tending to more intimate contact of the components and consequently to faster and more regular burning.

In 1846, nitrocellulose and nitroglycerine were discovered, the former simultaneously by two Germans, Schönbein and Böttcher, and the latter by an Italian, Sobrero. Both proved to be extremely violent explosives, incomparably more powerful than gunpowder. The reason for this is that both are chemical compounds, the oxidiser and combustible being combined in the same molecule, and hence in the

## EXPLOSIVES: IN PEACE AND WAR

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*In addition to this general article, this work contains articles on special explosives, e.g. Dynamite; Gunpowder; Picric Acid; Trinitrotoluene, etc. See also Ammunition; Artillery; Detonator; Fuse; Gas, etc.*

Explosives (Lat. *explosus*, driven out) are solids or liquids or mixtures which, when chemical change is initiated at any point within them by heat or by a blow, can be converted in a very short time into stable substances that are wholly or mainly gaseous. The disruptive or propulsive effect of the explosive is produced by the sudden formation of gaseous products at a high temperature. The name "explosive" is limited by custom to solids or liquids, although many gaseous reactions are truly explosive. The production of gases at a high temperature, some of which are also readily combustible on admixture with the outside air, gives rise to the flame usually associated with explosion, although certain compounds, such as azide, explode without visible flame. In blasting explosives, the chemical reactions involved are oxidations; one constituent of the powder is oxidised by the oxygen contained in another (for example, the charcoal in gunpowder is oxidised by the potassium nitrate) or one portion of the chemical compound oxidises another portion of itself, as in the explosion of nitroglycerine or trinitrotoluene (T.N.T.). The explosion results from the fact that

the chemical changes occurring give out heat and that the reaction, once started, becomes self-supporting and spreads rapidly throughout the mass.

Many explosives, *e.g.* T.N.T., will burn quietly when ignited by a flame in an open space; others, such as mercury fulminate or lead azide, explode violently under whatever condition they are ignited. The latter substances also explode when struck by a hammer. Other initiating agencies include friction or rubbing, electric sparks, shock from an adjacent explosion. Differences in behaviour of explosives are due to their different speeds of reaction, resulting from the nature of the substance and the type of initiation of explosion: the explosion of gunpowder or cordite, even when strongly confined, is essentially a rapid burning, whereas with mercury fulminate or confined T.N.T. a very short period of burning rapidly culminates in a violent explosion with the production of an intense shock wave which is known as a detonation. These differences in speed of reaction determine the use of the explosive to produce a propulsive (propellant) or disruptive (high explosive) effect.

closest possible contact, far closer than can be achieved by mechanical mixture in gunpowder. They are types of a distinct class of explosives, termed the nitric esters, in which the hydroxyl groups (OH) of the raw material are more or less completely replaced by nitrate groups ( $\text{ONO}_2$ ) during nitration.

#### Nobel's Discoveries

Attempts to use these new substances commercially showed a number of unexpected difficulties. One problem was how to ignite them. A spark or flame had been the accepted method of firing gunpowder, but was inadequate for the new explosives which, however, were easily exploded by percussion. The ignition problem was solved by a Swedish chemist, Alfred Nobel (*q.v.*) who, in 1864, showed that mercury fulminate, previously used only in percussion caps for firing gunpowder, when exploded by a spark initiated complete detonation in nitroglycerine. Nobel's discovery, a landmark in explosives science, made possible the use of most modern high explosives.

Nitroglycerine is highly sensitive to percussion, and so many accidents attended its early manufacture and use that in many countries it was prohibited as a blasting explosive. After a number of dangerous experiments, Nobel in 1867 discovered that kieselguhr will absorb about three times its weight of nitroglycerine, yielding a plastic mass of sufficient insensitivity which he named dynamite. Its rapid adoption founded Nobel's fortune. Nitrocellulose in the form of guncotton began to be used as a military blasting explosive in 1868. Neither of the new explosives, however, could be used in guns, being too violent in their action, whilst they were too sensitive for shell fillings. Mixtures of ammonium nitrate with various combustibles, introduced in 1867, were found too insensitive for use as explosives until nitroglycerine was added. Another class of explosive—mixtures of nitric acid with organic combustibles—was invented by Sprengel in 1871, their essential feature being that the ingredients were non-explosive until mixed just before use. These were used for blasting on the Continent until replaced by more permanent solid compositions.

Sprengel also experimented with picric acid, or trinitrophenol, in 1871, but this explosive was not taken up until 1885, when Turpin proposed its use for shell filling.

The first high explosive sufficiently insensitive for this purpose, it belongs to a new class—the nitro derivatives of the aromatic hydrocarbons. Smokeless powder (nitrocellulose whose structure has been modified by gelatinisation) was used successfully as a propellant for sporting gun ammunition in 1865, and for military purposes in 1884. Its decomposition in this form was extremely rapid combustion rather than explosion.

Picric acid was found to be liable to form picrates, which are sensitive, and in itself proved somewhat too sensitive for use in shells for large guns. Nitration of other aromatic hydrocarbons was therefore attempted, but did not become a commercial success until the manufacture of cheap, highly concentrated sulphuric acid was a commercial possibility. Trinitrotoluene then sprang into prominence, becoming the basis of military high explosives.

#### Types of High Explosives

High explosives are of two classes: (1) primary or initiator explosives, which are very sensitive and detonate when heated or subjected to shock, such as a blow; (2) secondary explosives, which detonate under the influence of shock from a detonated, initiating, or another secondary high explosive. The initiatory type of explosive is used almost entirely in making detonators or caps, whilst those of the secondary type are used to fill shells, bombs, mines, and torpedoes, and for blasting.

MILITARY HIGH EXPLOSIVES are few in number, the principal being trinitrotoluene (T.N.T.), picric acid, tetryl (C.E.), amatol (ammonium nitrate-T.N.T. mixture), ammonium picrate, hexyl, R.D.X. (cyclonite), and penta-erythritol tetranitrate (P.E.T.N.).

An explosive must conform to very stringent standards before it is acceptable for military purposes. Besides possessing the necessary power, it must be (1) sufficiently insensitive to shock and blow for safe handling in the field and in the factory, (2) resistant to deterioration on long storage in filled weapons, and (3) non-poisonous, non-volatile, stable, and non-absorbent of moisture. Easy production from available materials is also desirable.

During the Second Great War, several new explosives were developed, especially to meet new and specific requirements such as demolition of large fortifications, penetration of heavy armour and concrete, and the production of

high blast effect. Among the more important of these were R.D.X. (used in depth charges) and P.E.T.N. The older explosives, T.N.T., amatol, picric acid, tetryl, and hexyl, developed during the First Great War were, however, used more extensively. The very high demand for explosives during the war resulted in the loading of ammunition on a mass production scale by the use of melt or cast loading, in which the high melting explosive, *e.g.* ammonium nitrate or R.D.X., was mixed with the lower melting T.N.T., the weapon being filled with the resulting thick slurry. Aluminium powder was often used in addition in these explosives, to enhance the blast and incendiary effect of the filling.

BLASTING EXPLOSIVES are extensively used in mines and quarries and in civil engineering to supplement the work of man and machine in breaking down for removal rock, coal, or other material. They are divided into two groups, (1) permitted, those whose use is allowed in coal and other mines where there is danger of explosions of firedamp and air and of coal-dust and air, (2) non-permitted, use of which is allowed only in quarries and for other open work where there is no danger of gaseous or dust explosion. Explosives must pass a stringent government test before they are placed on the Home office and Board of Trade lists (published annually) of permitted explosives.

#### Materials for Blasting Operations

Blasting explosives can be classified according to whether their sensitive explosive component is nitroglycerine or another high explosive material. Nitroglycerine explosives are subdivided according to their physical state into gelatines, semi-gelatines, and powders; and into permitted and non-permitted explosives. Nitroglycerine freezes at  $13^\circ\text{C}$ . ( $55^\circ\text{F}$ .) and at that temperature all explosives containing it freeze to a hard mass unsuitable for use. Failures from this cause have led to accidents, and all nitroglycerine explosives used in Great Britain are therefore of low freezing type, *i.e.*, they do not freeze at any temperature likely to be encountered in that country. This is achieved by replacing about  $\frac{1}{4}$  of the weight of nitroglycerine by nitroglycol, and the term N/G in this article is used for this mixture.

The parent gelatine in blasting gelatine is the strongest known

commercial explosive; it contains over 90 p.c. N/G, the remainder being nitrocellulose with a small quantity of stabiliser. Other gelatine compositions have been developed by replacing part of the N/G by other oxidising ingredients such as potassium nitrate, sodium nitrate and ammonium nitrate, carbonaceous material such as wood meal being added to take up the excess oxygen liberated in the explosion. Permitted gelatines are made by incorporating into the non-permitted a fairly large quantity of inert substance—sodium chloride is generally used—which reduces the temperature and also the power of the explosion. Semi-gelatines contain a higher proportion of solid ingredients than the gelatines, but the powder is still bound by a nitroglycerine jelly. The ammonia dynamites, in which ammonium nitrate provides the chief source of power, belong to this class. The original nitroglycerine blasting powder was dynamite, which consists of N/G absorbed by a siliceous earth, kieselguhr. Since the latter substance is inert and reduces the power, combustible absorbents were developed, mixed with sodium nitrate as oxidising agent. Most of the nitroglycerine was later replaced by ammonium nitrate, an explosive substance as well as an oxidising agent, but sufficient nitroglycerine was left to sensitise the mixture.

In the non-nitroglycerine type of blasting explosive, the sensitiser is usually T.N.T., which is mixed with a metallic nitrate or ammonium nitrate to compensate for its lack of oxygen. Permitted non-nitroglycerine explosives are made by the incorporation of salt into the composition.

PROPELLANTS are self-combustible materials which, on ignition and acting against a movable resistance such as a bullet or shell in a gun barrel, produce by virtue of the production of gases at high pressure and temperature a propulsive effect. Such explosives on initiation by a cap give a rapid combustion, the rate of which is markedly dependent on pressure, but very many times lower than the velocity of detonation of high explosives. Propellants in actual use are based upon nitrocellulose; many powders contain in addition nitroglycerine and other explosives.

Gun-cotton and collodion cotton can be used in their fibrous form, but in service propellants of the cordite type, and in many non-military powders, the fibrous structure of the nitrocellulose is to a

considerable extent destroyed by colloidising (gelatinising) with a solvent for nitrocellulose. Propellants are classified as single or double base powders, according to whether they contain nitrocellulose alone or with other explosives. American service powders are, in the main, single base, whereas in British cordites the nitrocellulose is gelatinised with the powerful explosive nitroglycerine.

Besides the main ingredient and stabilisers to increase the keeping properties of the propellant, other substances are added for special purposes. Some powders contain "flash reducers," which act as cooling agents and serve to prevent the blinding flash which occurs when the hot combustible gases leaving the muzzle of the gun mix with the external air. Flashless charges developed during the Second Great War made it possible to fire at night-time without disclosure of the position of the gun. Moderants or deadeners such as oils or wax are sometimes added to control the speed of combustion. Military gun propellants are made by an extrusion process in the form of threads, tubes (single or multi-perforated) which vary in size from  $\frac{1}{16}$  in. to  $\frac{1}{2}$  in. or more according to the size of the gun, and the shell velocity required.

Small arms propellants usually consist of a bundle of thin cordite sticks or threads.

#### Second Great War Developments

Liquid rocket propellants were developed during the Second Great War. Fuel and oxidant, carried in separate tanks, were forced into the combustion chamber. The products of combustion, on passing out through a jet, provided the propulsive action, as in a normal rocket based on a powder propellant. In the German rocket (V 2), whose range was about 200 miles, the liquids used were liquid oxygen and alcohol. Another major fuel development during the war was the production of concentrated hydrogen peroxide, which could be decomposed almost instantaneously to give oxygen and steam when permanganate solution was mixed with it. The superheated steam plus oxygen generated was used to operate the turbine fuel pumps of the V 2 and for the direct propulsion of a rocket-propelled glider bomb. The German rocket-propelled fighter—the Me 163—was operated on the bi-fuel system—hydrogen peroxide (T-Stoff), and a mixture of hydrazine hydrate and alcohol (C-Stoff). The latter was also used as cooling agent.

Non-military propellants, used for shot-gun, revolver, and rifle powder (sporting powders), and also for power purposes, are, like military powders, based on nitrocellulose and may be classified in three main groups on the basis of their composition and physical structure:

#### Propellants for Civilian Purposes

(1) Fibrous nitrocellulose (N/C) powders, in which the N/C substantially retains its fibrous structure. These are fast powders and are used in shot-guns which require low operating pressure and low resistance. The powders are prepared in granular form suitable for easy loading into the cartridge. The term bulk powder is often used in connection with shot-gun powders and derives from the time when black powder, which is still used to some extent, was the standard shot-gun powder. The standard charge of gunpowder was 3 drams, and the charge was measured by volume in a container designed to give this weight of charge. When smokeless powders were introduced they were designed to occupy at the required weights the standard volume of the 3-dram black powder measure. Thus, a 33-grain powder is one in which 33 grains, the charge necessary for standard ballistics, occupies the volume of the standard black powder measure. The difference in the rate of burning of powder of any one class is broadly determined by the amount of inert material used in the make-up of the powders.

(2) Gelatinised nitrocellulose powders in which the fibrous structure of the N/C is to a considerable extent destroyed by gelatinising with a solvent for the N/C. The dough-like mix resulting is extruded through suitable dies and cut to the required granulation, and the volatile solvent removed by stoving or steeping in water. These powders are often made porous by the incorporation of soluble salts which are subsequently leached out by water. The effect is to increase the effective burning area and produce a powder giving a fast rate of gas production. Revolver powders and powder for .22 rimfire ammunition are gelatinised porous powders based on N/C.

(3) Gelatinised nitrocellulose-nitroglycerine powders, in which the N/C is gelatinised by the high energy explosive nitroglycerine, are similar to military cordites. The so-called "express" sporting rifles used loads of this nature.



Double base powders are rendered porous in the same way as the gelatinised single base powders.

The gelatinisation of nitrocellulose by nitroglycerine can be brought about by heat and pressure alone; for example, by working on hot rolls, without the aid of volatile solvent. The sheets so obtained can be coiled and extruded from hydraulic presses, under conditions of vacuum pressing to exclude air, through suitable dies. This is often essential in producing the large sizes of propellant required for power cartridges. These are not for use in firearms at all, where the time of operation is measured in thousandths of a second, but are specially designed for applications of gas pressure in the engineering field involving much longer times of operation, from tenths of a second to 2 minutes. Such cartridges and charges are used for propelling military rockets, assisting take-off of aircraft, starting aeroplane or other engines, lowering aeroplane undercarriages, etc. In fully gelatinised propellants of this type, burning takes place from the surface in parallel layers. For the longer burning times, the so-called "wrapped cordite charge" is used in which all but one end of a cordite rod is protected by a relatively incombustible tape wrapping, so that the cordite burns from one end only like a cigarette. In this way the factor controlling the burning time becomes the length of the cordite stick instead of its diameter, and the burning time is limited only by restrictions on the size of the apparatus used.

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**Explosives Law.** A new Act concerning explosives was passed in England in 1860, and amended in 1861 and 1862, repealing all previous Acts. In 1875 a new Explosives Act was passed dealing comprehensively with the whole question. This was based on the report of the house of commons committee appointed to inquire into the terrible explosion on the Regent's Canal in 1874, and still

governs the whole question. Part I deals with gunpowder, which may be manufactured only in licensed factories and kept in licensed magazines under specified conditions. Part II deals similarly with nitroglycerine, and other high explosives; Part III with inspection, accidents, search, etc.; and Part IV gives supplementary provisions. Regulations concerning the use of explosives for blasting in Great Britain are laid down in the above Act, the Quarries Act of 1894, the Coal Mines Act of 1911, and the Mining Industry Act of 1920. The term explosive may include any substance deemed to be specially dangerous to life. Because many of the newer explosives are of a poisonous nature, regulations can also be made to safeguard the health of workers. Most other countries have introduced similar legislation. The Merchant Shipping Act of 1894 regulates the carrying of explosives in British vessels.

**Exponent** (Lat. *ex*, from, out; *ponere*, to place). Symbol of an algebraic expression denoting the number of times the expression is to be multiplied by itself. Thus in the expression  $a^3$ , the figure 3 is the exponent of  $a$ , and the expression is equivalent to  $a \times a \times a$ .

**Exponential.** A term used in mathematics. The exponential function is the inverse of the logarithm: thus if  $y = \log x$ , then  $x$  is said to be the exponential of  $y$ . See Logarithms.

**Exports** (Lat. *ex*, from, out; *portare*, to carry). Commodities sent to foreign countries in the course of trade. In the U.K. exports are valued at a figure that includes all charges up to the point at which they are on board the exporting ship, while imports are valued at a figure that includes, in addition, insurance and freight. Before a true comparison can be made between total exports and total imports, the relevant costs of insurance and freight must therefore be added to the recorded value of exports. Current practice takes into account other financial factors not normally recorded in the trade figures. This makes it possible to calculate a periodical balance of payments, which is more important than the mere balance of exports and imports.

United Kingdom exports are classified by the Board of Trade thus: food, drink, and tobacco; raw materials; manufactured articles; parcel post. In the first class the chief exports are beverages, fish, sugar; in the second,

coal; in the third, pottery, iron and steel goods, machinery, vehicles, chemicals, textiles. The chief customers for exports of the U.K. are India, Australia, the U.S.A., Canada, Argentina, and the U.S.S.R.

In measuring increases and decreases in the total value of exports from year to year, differences in the purchasing power of money must be taken into account. A total of £393 millions in 1945, when corrected for price changes, becomes only £214 millions at 1938 prices, in which year exports were valued at £471 millions—a much less favourable ratio.

Since 1913 the normal course of international trade has been completely interrupted by the impact of war, and like other countries the U.K. suffered a decline in exports. She became for the first time a debtor nation and had to raise foreign loans; coal, hitherto her great export, was partly superseded by oil and electrical energy; and countries that had for centuries taken her manufactures were now providing their own. By developing her vast resources the U.S.A. became a formidable rival. Despite these difficulties, the conclusion of the Second Great War saw the core of British export trade still sound; taking the 1938 volume as 100, the volume of exports in 1946 was 99.3 and in 1948 was 136.3. The end of the war saw also the beginning of attempts at international regulation of trade by conventions, e.g. at Bretton Woods (*q.v.*). See Invisible Exports.

**Exposition** (Lat. *exponere*, to set forth). In music, the placing out or setting forth of the themes and materials upon which a piece is constructed. In fugue the exposition includes the first entries of all the voices or parts. In sonata form it includes the first presentation of the chief themes, before their development or elaboration is entered upon. See Fugue; Sonata.

**Exposure.** In photography, the amount of light passed by a lens; or, in photographic contact, printing, the amount of light, passed by the negative, which is allowed to influence the sensitive material. It is usually expressed as a period of time, subject to known factors of type and intensity of light. For any particular sensitive material and standard development conditions a curve may be plotted to show the relative increase of density or blackening with increasing exposure. This is known as the characteristic

curve of the emulsion in question. Correct exposure is that which confines the range of densities in the subject to the straight line portion of the curve.

The factors affecting exposure may be divided into those values capable of reasonably accurate measurement and those difficult to assess. The first class includes (1) the speed of the sensitive material in use for a certain type of light; (2) the aperture of the lens; (3) the effective speed of the shutter; (4) such factors as geographical latitude, period of year, and time of day. The second class includes (1) the actual intensity of light falling upon the subject; (2) the light reflected—this latter is governed by the type of subject.

**EXPOSURE METER, or Calculator.** This estimates correct exposure. It may take one of many forms. Calculators take into consideration all the factors of the first class enumerated above and any modification due to use of filters; but the actual brightness of light and type of subject are left to individual judgement. Actinometers improve on this by seeking to measure the brightness of the light falling upon the subject. In the Bee and Wynne meters this is ascertained by noting the time required for a piece of specially sensitised paper to darken to the same density as a permanent tint placed alongside it. Visual extinction meters measure the amount of light reflected from the subject by inspection of a series of figures or letters, light on a dark ground, of decreasing densities in a darkened chamber provided with an eye-piece at one end and directed towards the subject. Photo-electric exposure meters measure the intensity of the light falling upon or reflected from the subject by purely physical means, containing a sensitive cell which, when light falls upon it, generates an electric current of a magnitude proportionate to the intensity of the light.

No type of exposure meter will give entirely accurate results under all conditions; intelligent judgement must be exercised in relation to the type of subject. Even the photo-electric system derives light for its reading almost entirely from the highlights, and it is the relative depth of the shadows, of which the meter takes no account, which is the final determining factor.

**Express System.** Name for a special delivery service for letters and parcels provided by the general post office in the U.K.

Letters and parcels that are conspicuously marked "express" above the address may be handed over the counter at post offices that deliver telegrams, whence they will be taken to their destination by a telegraph messenger. The charge is 6d. a mile, with a surcharge of 1d. on each separate letter or packet after the first. Live animals, liquids, or money can be delivered by the service. The delivery also applies to letters transmitted by post and delivered by special messenger; the charge is 6d. additional to ordinary postage. Special delivery is also made of messages telephoned to a post office; the charge is 6d. a mile.

**Expression, FACIAL.** Outward indication on the features of the inward character or emotions. Sir Charles Bell first put the matter on a scientific basis in his essay on the Anatomy of Expression in Painting, 1806. Continental writers followed, but the classic work on the subject is Darwin's Expression of the Emotions in Man and Animals, 1872, in which are set forth physiological reasons for the variety of expression of which human faces, and in a lesser degree the faces of animals, are capable.

Darwin maintains that some human expressions, such as the bristling of the hair under the influence of extreme terror, or the uncovering of the teeth under that of furious rage, can be understood only on the assumption that man once existed in a much lower and animal-like condition. He thinks the movement of the same facial muscles during laughter by man and by various monkeys indicates descent from a common ancestor. *See Acting, illus.*

**Expressionism.** Art movement. As applied to the drama of ideas, expressionism was concerned chiefly with the unfamiliar in subject matter. It enlarged the scope of drama, the basic principle being that no human experience is outside the range of dramatic treatment. Such 19th century dramatists as Strindberg and Ibsen were the precursors of the movement, though Strindberg wrote many years before the term had been introduced by German critics. In his *Spook Sonata*, *The Dance of Death*, and *The Father*, types rather than individuals dominate the scene. In Germany, Kaiser's *Gas*, and Toller's *Man and the Masses*, were distinguished examples of expressionistic symbolism. These plays influenced a whole school of later writers in the experimental theatre of the 1920s

and 1930s. Pirandello's *Six Characters in Search of an Author* (one of the most original contributions to expressionistic drama), Capek's *R.U.R.*, O'Casey's *The Silver Tassie*, Auden's and Isherwood's *The Dog Beneath the Skin*, Priestley's *Johnson over Jordan*, all depend for their effect upon unfamiliarity of treatment.

In painting, abstract expressionism developed in Germany shortly before and after the First Great War. Evolved in 1908 by Kokoschka in Vienna and Pechstein in Berlin, a crude form of expressionism, as yet uninfluenced by the Cubists, served as a reaction against impressionism. In Great Britain, France, and the U.S.A., this movement was termed post-impressionism (*q.v.*). The influence of Cézanne, Gauguin, and van Gogh was at first predominant, but expressionism later adopted a semi-cubist manner as exemplified in the work of Franz Marc, *i.e.* forms based on architecture and three-dimensional geometry. The Russians Kandinsky and Javlenky gave impetus to the German painters. Klee, whose preoccupation with pattern and colour represented a more subtle form, influenced younger schools of painters. An attempt was made by later expressionists to return to more naturalistic forms, this development receiving an impulse from the naive-realistic manner of Henri Rousseau.

**Express Rifle.** Name given to a heavy sporting rifle introduced in 1856 and since developed into a number of types used for big game, especially elephant hunting. Express rifles vary in calibre from 0.303 in. to 1.052 ins. The weight of the barrel varies from 6 to 16.5 lb., and the length from 22 ins. to 30 ins. The range varies between 250-500 yds. Certain types of express rifle are double-barrelled.

**Extended Order.** A military formation in which the ranks and files of troops on parade are separated by a distance of two paces. The term is also applied to troops advancing to the attack and dispersed over as wide an area as possible so that they will not offer an easy target.

**Extension.** Term used in engineering for the stretching of materials under tension. Every material stretches under a pull, though the amount may be relatively small. A bar of wrought iron one inch square will stretch only one twelve-thousandth of an inch with a pull of a ton upon it. Heat causes expansion, but this

should not be confused with extension in engineering. Within the elastic limit of the material the strain is directly proportional to the stress which produces it. The strain is defined as the ratio of the extension to the original length of the bar. The ratio of the stress to the strain is an important constant for any solid and is called the modulus of elasticity of the material. If a solid is stretched beyond its elastic limit it does not return to its original length.

**Extensometer.** An instrument used in engineering and metallurgical design. It is often necessary to measure accurately the minute elastic extension of materials, in order to forecast their behaviour during usage. On a steel test piece two inches long this may be less than 0.003 inches, so very delicate measuring instruments must be used, of which the extensometer is one.

**Extent.** In law, a writ of execution to recover crown debts. The extent in chief was issued by the crown against the body, lands, goods, or other property of the debtor. The extent in aid was issued by a crown debtor against his own debtor so that he might be able to pay his debt to the crown. These writs are rare at the present day.

**Extenuating Circumstances.** Term used in English law. A jury may add a rider to a verdict of guilty that there were extenuating circumstances in favour of the prisoner. The judge may take this into account in the sentence, except in cases of murder and high treason, when he is bound to pass the capital sentence. In France, "Guilty with extenuating circumstances" is a different verdict from guilty; and the sentence is different.

**Extortion** (Lat. *ex*, out; *torquere*, to twist). In English law, a demand by an official, or someone else performing a public service, of money in excess of the amount due, or of money not yet due. It is applied by an extension to the act of obtaining money by means of threats, the offence known as blackmail. Extortion in the strict sense is punishable by fine and imprisonment, a number of statutes having forbidden it. Other forms may become robbery and be punished as such.

**Extract** (Lat. *extractus*, drawn out). Term applied, in chemistry and pharmaceuticals, to products obtained by treating any substance with solvents and then evaporating

the latter. In a more restricted sense, an extract is a concentrated form of a vegetable drug. It contains the active part of the drug, the inert portion, consisting of woody fibre, being exhausted of its active principles during the process of extraction.

The various operations involved in extraction have received special names. Infusion is the process of allowing a drug to remain in contact with hot or cold water for definite periods of time; if the solvent is boiled during the period the process is decoction. In another common method, known as percolation, the comminuted drug is placed in a conical vessel and the solvent slowly passed through it. To reduce the liquid to a more concentrated form it is evaporated by heat. The extracts prepared in pharmacy are either thick liquids or soft pastes. The pastes are used as ingredients in making pills and lozenges.

**Extradition** (Lat. *ex*, out; *traditio*, handing over). Term used in law for the surrender, by one state to another, of fugitive criminals. As between the states, this depends on treaty; no state has an inherent right, apart from express agreement, to claim extraditory rights from another. Treaties for extradition now exist between most civilized states, but political criminals are invariably excepted from their operation. The manner in which extradition is applied for and granted depends upon the law of the country where the fugitive is. In England it is governed by the Extradition Acts, 1870-1935, which apply in relation to foreign countries, and the Fugitive Offenders Act, 1881, which applies within the British Empire.

By these Acts, a fugitive offender is not to be surrendered unless the foreign state concerned undertakes to try him only on the charge on which he is extradited. The fugitive is to be brought before a magistrate, who must be satisfied that the alleged offence is not political, and is one of the crimes for which extradition can be claimed. These offences range from murder to bribery. If the magistrate decides that the case is made out, he commits the alleged offender to prison, and then a secretary of state makes an order for the gaoler to hand him over to the representative of the foreign state. See International Law.

**Extragalactic Nebulae.** Systems consisting of thousands of millions of stars held together by

their mutual gravitational attractions but entirely separate from and in no way connected with the Milky Way. It is estimated that there are many millions of these objects within the reach of the biggest telescopes, and, together with the Galaxy, which is probably fairly typical of them, they constitute the whole known universe. See Nebula.

**Extra-Mural Education.** Literally, education "outside the walls." The term is applied to all activities of a university which aim at extending directly its teaching and influence among those members of the community who would not otherwise have the advantage of contact with university teachers or experience of a course of study of university type. After centuries in which Oxford and Cambridge were as indifferent to the intellectual condition of the masses as these were ignorant of the universities, during the second half of the 19th century a great change took place. Scientific discoveries, the spread of the ability to read, the awakening of the public conscience by Shaftesbury, Ruskin, Jowett, T. H. Green, etc., induced in some of the finest scholars of Oxford and Cambridge the desire to propagate culture. In 1871 the religious tests were abolished which had hitherto kept dissenters out of Oxford and Cambridge. In 1872 the university extension movement began, providing courses of evening lectures of university standard for working men and women, principally on non-technical subjects. Eventually such lectures were arranged in most large towns and even in villages, their success probably helping much to stimulate the establishment of the provincial universities.

But university extension classes affected only those among the working class already converted to the value of education. They left the masses untouched. University settlements were begun in London, first at Toynbee Hall in 1884, and then in Camberwell, Bermondsey, Bethnal Green, etc.; subsequently in other cities. Today every university in Great Britain and some in America have settlements or missions which link academic work in practical fashion to the social problems of the time. Some of the best known politicians, clergymen, lawyers, and authors served apprenticeship in a university settlement. In 1903 the Workers' Educational Association (*q.v.*) was founded by

Albert Mansbridge, and it has cooperated with the universities in extra-mural education.

**Extraterritoriality.** A term used in international law. It describes the status of a person who, when in foreign territory, is immune from the jurisdiction of local laws and courts. Sovereigns and diplomatic agents are considered such persons by ancient usage. If a sovereign is abroad, his house is extraterritorial; and the official residence of an ambassador is, by courtesy, part of the country which he represents. Hence no arrest can be made there under a local warrant; nor is the house assessable to rates and taxes. Sometimes by treaty all the subjects of one state residing in another are made extraterritorial for purposes of justice. A ship of war in a foreign harbour, behaving peacefully, remains a part of the country whose flag she flies; and a military force in a foreign country is not subject to the laws of that country except by agreement: *e.g.* the British army in France during the First Great War was subject not to French but to English military law, and during the Second Great War reciprocal arrangements were made, *e.g.* in respect of American forces in Great Britain and British forces in the U.S.A. The system whereby extraterritoriality was granted to European subjects in Eastern countries has been brought to an end. In China extraterritorial rights were relinquished by treaties negotiated in 1943-44.

**Extravasation** (Lat. *extra*, outside, beyond; *vas*, vessel). Outpouring of fluid into the tissues from an injured vessel. The most familiar example is the extravasation of blood which may follow a blow on the skin resulting in the formation of a bruise.

**Extreme Unction** OR SACRAMENT OF THE DYING. Fifth of the seven sacraments of the Roman Catholic Church. It was instituted for the spiritual and bodily comfort of those in *extremis*. Recognized also in the Greek, Coptic, Armenian, and Nestorian Churches, with varying ceremonial, and dating from the 12th century, it is regarded as authorised by James 5, *vv.* 14-15, and is administered by the priest, who anoints the dying person.

Unction is usually applied to the seat of each of the five senses, with prayer, *e.g.* "Through this holy unction, and His most tender mercy, may the Lord pardon thee whatever sins thou has committed

by seeing. Amen." With the other senses the necessary word is used in place of "seeing." In Roman usage the oil is applied in the form of a cross, after reception of the Viaticum or Holy Communion. In the Church of England the rite was abolished in 1552. *See* Sacrament.

**Extrovert.** Psychological term used by Jung. It and its opposite, introvert, denote the two types of temperament into which he divided the human race. The extrovert is interested in external reality and adapts himself to it; the introvert is interested in his own personality, needs, etc., and tries by day-dreaming, wishful thinking, and similar devices to adjust reality to himself. The distinction is of little scientific value since (a) most human beings fall between the two types, and (b) the reactions themselves are not fundamental traits, but depend upon whether the environment is pleasant, terrifying, etc. *Consult* Psychological Types, C. G. Jung, 1923.

**Extrusion.** Process used in the fabrication of glass, plastics, viscose, and metals into rods, channels, threads, and wires. In metals, a billet is heated until pliable; for aluminium and its alloys 300-400° C. would suffice, for brasses about 800° C. While still hot it is placed in a preheated container in a press, which is operated either mechanically or hydraulically, in either of two ways. In the direct process, the fixed end of the container carries a die, shaped to form the extruded cross-section desired; the other end is a pad, only slightly smaller than the inside of the container in diameter, and behind the pad is a ram. When pressure is applied to the ram the pliable material is forced through the die, and so shaped. The inverted process employs a moving die in place of the ram and

pad, the die being forced into the billet which remains stationary in the container. Tube may be extruded by piercing the billet with a plunger before extrusion and then using the plunger as a mandrel. Very high pressures are employed and 1,000-ton hydraulic presses are common. *See* Glass; Plastics; Silk, Artificial.

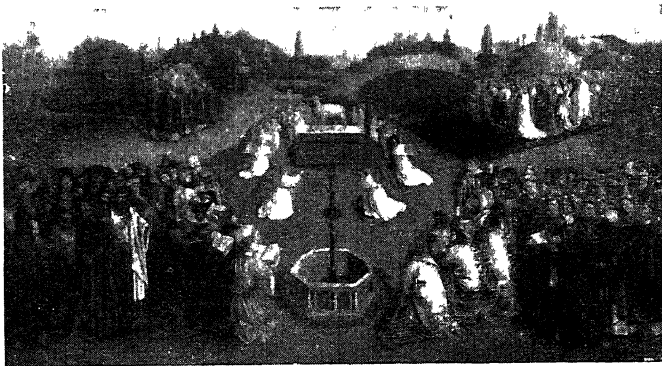
**Exuma.** Two of the Bahama Islands, known as Great and Little. They lie S.E. of Andros Island and W. of Long Island. Great Exuma is 30 m. in length and contains the chief settlement, Georgetown. Total pop. 3,774.

**Eyam.** Parish and village of Derbyshire, England. It stands in Eyam Dale, 5 m. N. of Bakewell. In the churchyard is a Runic cross, and there are several barrows, one of which, on Eyam Edge, is more than 100 ft. in diameter. During the plague of 1665-66 the inhabitants voluntarily cut themselves off from the outside world and most of them perished. *Pron.* Eem.

**Eyck, HUBERT VAN** (c. 1366-1426). Flemish painter. He was born at Maeseyck, in the prov. of Limburg. Before settling at Ghent as court painter, early in the 15th cent., he spent some time in N. Italy. He probably began, and his brother Jan certainly completed the altar-piece of The Adoration of the Lamb, executed for the cathedral of S. Bavon at Ghent, where he died, Sept. 18, 1426. Certain panels sold in 1816 and long in German possession were reunited and restored to Belgium under the



Hubert van Eyck,  
Flemish painter  
From an old print



Eyck. The Adoration of the Lamb, the central panel of the altar-piece at the cathedral of S. Bavon, Ghent, the master-piece of the van Eyck brothers



Jan van Eyck's famous picture,  
Jan Arnolfini and his wife  
National Gallery, London

treaty of Versailles. Few authentic works by Hubert are known. There were some in Berlin and one each in Paris, Madrid, and Copenhagen.

Both painters rank among the greatest of the Flemish school. Their drawing and finish were meticulously exact, their colouring is almost as fresh and brilliant as it was 500 years ago, and they so improved the method of oil painting that they made it virtually a new medium. They were not, however, as sometimes alleged, its discoverers. A 10th century MS. by the monk Eraclius (*De Coloribus et Artibus Romanorum*) states that a method of grinding colours with oil was then "in the air," and Rogierus, a monk of the

12th century, recommended that colours should be ground with oil and mixed. The nature of the improvement introduced by the van Eycks seems to have been regarded as a craft secret, but it was conjectured that it was some essential oil which yielded a clear, transparent, liquid vehicle, which retained its limpidity, dried without darkening, and, when mixed with colours, gave results so superior as to supersede the viscous varnishes formerly in vogue. Consult H. and J. van Eyck, *Their Life and Work*, W. H. J. Weale, 1908. *Prom. Ike.*

**Eyck, JAN VAN** (c. 1385-1440). Flemish painter, brother of Hubert. Born at Maeseyck, he appears to have resided in The Hague during 1422-24, at Bruges for a few months in 1425, in which year he went to Lille, where he remained for four years, and later visited various foreign countries in an official capacity as painter to fulfil state commissions. He died at Bruges July 9, 1440. He is represented at his best in the National Gallery, London, by the magnificent picture of Jan Arnolfini and his Wife, and at the Louvre by the exquisite Chancellor Rollin Kneeling before the Virgin. Margaret (c. 1377-1430), his sister, was also an excellent painter.



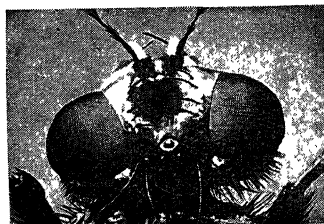
Jan van Eyck,  
Flemish painter  
From an old print

are called ommatidia. Each has its own lens system, and a crystalline rod which seems to concentrate light on a sensitive cell. The ommatidia are optically isolated from each other by pigment. In many kinds of arthropods there are also simpler eyes, apparently derived from the in-pushings still found in their cousins the worms.

In molluscs the eyes are also fundamentally in-pushings, and in the most highly evolved forms, such as the cuttle fish, these eyes may be very complicated and are, it would seem, very effective.

All these eyes are always connected to the nervous system by nerve fibres. Light is nearly always concentrated on the *faces* of the sensitive cells of the in-turned skin which transmit, by these nerve fibres, the changes resulting in them from being subjected to light.

In the vertebrates, however, the eyes are essentially a part of the central nervous system itself which has been brought near to the surface, and to which have been added other elements co-operating in the formation of a functional whole. Their development through the whole of the vertebrate series is very similar. The central nervous system of the vertebrate, such as man, is a hollow tube made of ectoderm (*q.v.*), of which the bore varies at different points along its length. Near the front end, in the embryo, there is a considerable enlargement called the 3rd ventricle, and on each side, from the bottoms of the walls of this chamber, there is pushed out, by growth, a hollow diverticulum whose inside is continuously in communication with the space of the 3rd ventricle. This outgrowth is called the optic stalk. It is simply a part of the wall and floor of the brain which has grown fast and therefore got pushed out. As it grows, the advancing front end, that is the end farthest from the brain, enlarges. This, again, is by growth—the front end grows faster than the rest of the optic stalk, and the



Eye. Compound eyes of the housefly, highly magnified

## EYE: THE ORGAN OF VISION

Paul G. 'Espinasse, Prof. of Zoology, University Coll., Hull,  
and D. Stenhouse Stewart, M.R.C.S., D.O.M.S.

*An explanation of how the eye, particularly in human beings, develops with the development of the embryo, and of how it perceives light and images. See also: Light; Optics; Vision, etc.; and for disabilities and diseases such headings as Astigmatism; Blindness; Conjunctivitis; Glaucoma; Myopia; Orthoptics; Sight; Spectacles, etc.*

Protoplasm, the material of which living things are made, is commonly affected by light in ways which show themselves in a change in the behaviour of the living thing. In the more advanced forms, this capacity to react to light, while by no means restricted to any area, is much greater in one kind of organ—the eye—than it is over the rest of the body.

In the invertebrates there are eyes of many different kinds. They are always developed from the outer skin which may fold in and become transparent over the fold. In the arthropods, and in

particular in the insects, a most elaborate eye has evolved, having a considerable degree of efficiency. In it the optical elements are separate, so that the animal receives, apparently, a picture reminiscent of a photograph reproduced by printing from a half-tone block. It must consist of dots of light or shade, according to whether that part of the image falling upon any particular isolated optical element in the eye is light or dark. This is quite unlike any other eye, and must presumably have been evolved quite independently. The optical elements

dorsal part of this front end grows even faster than the ventral. This enlarged end is called the optic vesicle. The optic stalk starts by being roughly circular in section. This does not last: it becomes indented by a longitudinal groove which folds in along its ventral surface. The front of the optic vesicle gets pushed in by a forward extension of this groove. When the front has been pushed in the structure is called the optic cup, and it looks, from its front, like a cup with one crack in it, the embryonic fissure, or choroid fissure. This optic cup has a double wall. The space between the outer and inner walls is still in communication with the cavity of the 3rd ventricle.

At this stage of the development of the embryo the whole of the central nervous system is receiving upon its surface a condensation of loose mesodermal tissue. This condensation, or skin, is called the pia mater, and that part of it which condenses on the developing eye is called the choroid layer. From the first this choroid layer is applied to the whole of the surface of the structure under consideration; this includes the inner surface of the optic cup, simply because this was formed by the pushing in of the optic vesicle. In all this choroid layer blood vessels develop, as, indeed, they do in the rest of the pia mater. From these vessels is provided the vascular system of the eye, in both outer and inner layers.

Many of the cells forming the inner of these two layers of the optic cup (destined to form the light-sensitive retina in the adult) proliferate, and some grow tails which run back to the floor of the 3rd ventricle, these tails all growing towards the top of the embryonic or choroid fissure and then burrowing their way back to the brain in the material making up the roof of the groove in the optic stalk. When these tails reach the brain they make contact with other cells which have stayed in the brain. Together, these tails make up the adult optic nerve. They are very numerous indeed.

and a transverse section of them all together makes an immensely larger picture than a transverse section of the original optic stalk, in the floor of which they really begin to run.

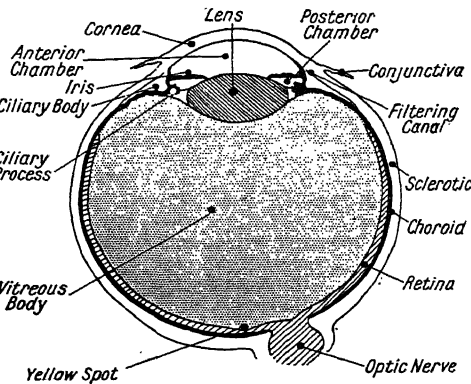
The blood vessels in that part of the pia mater or choroid layer which is applied to the inner, or retinal, layer grow in an organized way so that they become oriented as elements radiating also from the top of the embryonic, or choroid, fissure. They are supplied and drained by larger vessels running in the pia mater along the groove. The inner aspect of the optic cup will now show vessels and nerve fibres all running to and from the top of the fissure. The lower part of this fissure closes, by the apposition of its sides, leaving a hole at its top. This hole is

transparent fibres grow backwards and forwards within the capsule, enveloping and compressing the central core or nucleus, the transparency of which may diminish in advanced age. The transparent fibres may also lose their transparency, so that vision may be impaired to a greater or less extent. Any such condition is known as cataract, and, if so opaque as to warrant it, the lens can be removed from within the capsule, and the optical properties of the whole system restored by special spectacles. A second, lesser, operation is sometimes necessary to ensure a clear opening in the capsule that remains. Alternatively, the whole lens can be removed, capsule and all. This is a difficult operation; but if it is successful the cure is complete.

After the lens has been contributed to the developing eye, a space appears in the mesoderm between the lens and the now completely healed skin. This space becomes the aqueous chamber of the eye. It is wholly lined with mesoderm, and becomes filled with fluid, called the aqueous humour.

Everything so far described as entering into the formation of the eye is now involved in a second condensation of mesoderm which, like the first, envelops the whole central nervous system. This second condensation is called the dura mater, and it forms a tough membrane. The white and rather opaque part which envelops most of the growing eye is called the sclerotic; the part overlying the aqueous chamber is transparent and is called the cornea.

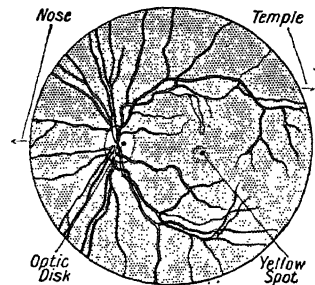
The skin once more produces over the developing eye an in-pushing. This remains outside the developing sclera, and is therefore never a part of the true eye at all. It spreads, and separates the lids from the eyeball. This cavity is lined with conjunctiva, a layer of skin (ectoderm with



Eye. Sectional diagram of the human eyeball, seen from above, showing the positions of the various structures which receive and transmit visual impressions

filled up by all the vessels and nerves which have therefore to run through it. It is the one part of the inner aspect of the back of the eye which does not have light-sensitive elements in it. It remains blind, and is called the blind spot, or optic disk, and from it radiate in the adult eye all the arteries and on it converge the veins and nerve fibres which enter into the structure of the complicated adult retina.

During the processes described the growing optic cup has been closely approaching the outside skin of the embryo. The sink immediately overlying the optic cup develops a small hollow in-pushing. This in-pushing heals, and closes off a hollow spherical bubble of ectoderm which is contributed to the eye. Its hollow is filled by growth of the cells of the back wall, and it forms the transparent lens of the eye surrounded by a capsule of mesoderm. From the front cells



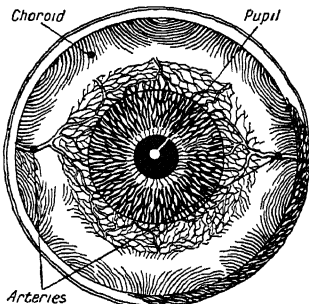
Eye. Diagram of the retina showing position of optic disk



underlying mesoderm with blood vessels) which is translucent and which thins out to overlie the transparent cornea.

The lens, caught between the front of the optic cup and the back of the aqueous chamber, gets attached to the front of the optic cup by a complicated system of fibres and muscles called the zonule and ciliary body. By the outward pull of these on its equator the lens, which has so far been roughly spherical in form, is made flatter. Vitreous humour fills the chamber behind the lens. If the lens of the human eye at rest is correctly flattened, an image of any distant object in the field of vision is focused accurately on the retina by the compound optical system set up by the cornea, the aqueous humour, the lens, and this vitreous humour. This whole system is kept in shape by the slight pressure of its contents. If this pressure should rise seriously, a condition known as glaucoma (*q.v.*) results. When anything near is looked at, the muscles of the ciliary body contract, allowing the young elastic lens to bulge, and to move a little forward so that the near object can be focused. This elasticity is lost with advancing years. If the eye grows too flattened the image will be focused in front of the retina, and the person with such an eye will be short-sighted.

After the lens of the embryo is in position, the rim of the optic cup, two layers thick, grows over the front of it, forming, with its mesodermal covering, the iris.



Eye. Behind the cornea, the transparent coat of the front of the eye, are the coloured, contractile iris and the pupil, through which light passes

This growth presently stops, leaving a round hole, the pupil, which can be contracted or dilated by muscular action. Thus is controlled the amount of light which enters the eye. The pupil is large in dull light and small in bright.

Except in albinos, who cannot make melanic pigment at all, the outer layer of the optic cup becomes heavily pigmented, to ensure that light enters the eye only through the pupil. In brown- or black-eyed people there is pigmentation in the front mesodermal layer of the iris. In blue-eyed people there is little or no pigment in the front layer of the iris, but the back layer is pigmented as usual.

#### Action of Light

The light-proof back of the eye is made up of the outer layer of the optic cup, black with melanic pigment, the sclera, and that part of the original pia mater or choroid trapped between them. The inner layer of the optic cup forms the highly complex retina, and the whole of the rest of the eye is an arrangement to bring light properly focused on to this retina, for it is here that the light is used. The pigmented epithelium is the inside of the outer layer, and the receptor layer is the outside of the inner layer. Between them is the obliterated cavity of the original optic stalk which was in communication with the 3rd ventricle of the brain. In a pathological condition the retina sometimes gets detached from the pigment layer. This is really the reopening of the old cavity.

The light-sensitive elements are of two kinds: rods, very sensitive to light, but probably not sensitive to differences in colour; and cones, which are rather less sensitive to light, but are probably sensitive to differences in colour. It is a remarkable fact that light has to go through all the vessels and connective tissue and nerve fibres shown there before it gets to the actual light-sensitive elements. This is quite unlike the condition in nearly all invertebrates, where the light falls on the *faces* of the sensitive cells.

The exact way in which the light brings about a change in the sensitive cells is not quite clear. It can be said, however, that a substance called visual purple (in no way to be confused with the melanic black backing pigment of the outer layer, from which it is wholly distinct in every way) is bleached by light. This substance is present in and among the sensitive cells, and there is some evidence that it mediates the chemical change which starts the propagation of a wave of change along the nerve fibres to the brain. When these impulses reach the brain they are sorted out and

perceived by a mechanism of which we know very little.

Rods and cones are not distributed equally all over the surface of the retina. At the blind spot there are neither. At a point near the middle of the back of the eye there are far more cones than rods. It is on this point that the image of the eye of a needle is focused when it is threaded, or of a colour when it is matched. Round the edge of the retina there are only rods, and it is here that faint stars are seen most easily. When trying to pick out a faint light at night it is best not to look straight at it. This keeps the image off the cones in the middle of the eye and on the rods. For the same reason, an electric light which is really flickering on alternating or interrupted current can often be seen to be doing so when its image is at the edge of the retina.

#### Appreciation of Colour

The details of the perception of colour are not understood. It is remarkable that part of the mechanism which seems to mediate it is present in animals which are certainly colour-blind. The eyes of most, if not all, mammals seem to contain cones which are thought to respond differently to different wavelengths of light, but for these differences to be perceived seems to require a further elaboration not of the eye but of the brain, which is present only in man and a very few other mammals and birds. Some insects certainly distinguish colours, but how they do it is not known.

In the vertebrates as a whole, there is a connexion between the optic nerves leading from the two eyes before they actually reach the brain. Rather more than half the fibres from the right eye reach the left side of the brain. The meeting of the two nerves gives a very obvious X-shaped structure called the optic chiasma, underneath the brain. In some way this arrangement permits the fusion of the two fields of vision of the two eyes into one percept.

The eyes lie in two cavities or sockets in the skull, known as orbits. This arrangement protects the eyes, for the bony margins of the orbits resist blows which would otherwise damage the eyeball. The eyelids and lashes also protect the eyes, and the lachrymal gland, which secretes tears and is situated at the outer side of the eye, is another protective device. The eyes are moved by six muscles each. A disturbance of the balance of these muscles in an adult

may cause headache or even double vision; in a child it causes a squint requiring immediate attention. If other means fail, the squint can often be corrected by surgery. *Consult* The Invertebrata, L. A. Borradaile, L. E. S. Eastham, F. A. Potts, and J. T. Saunders, 1932; General Zoology of the Invertebrates, G. S. Carter, 1940; The Vertebrate Eye, G. L. Walls, 1942.

**Eye.** Small hole, or loop, in certain articles, usually in a seam through which a cord or tape can be threaded to close the article. Eyebolts are screw bolts with a ring in them. The eyes of a sail are holes which take the lashings when reefing. A Flemish eye is the end of a rope bent to form a loop.

**Eye.** Mun. bor. and market town of Suffolk, England. It stands on an affluent of the river Waveney, 19 m. N. of Ipswich, on the railway. An ancient town, it has castle ruins, a grammar school founded in 1566, a town hall, and corn exchange. Brewing is an industry. Market day, Mon. It gives its name to a co. div. returning one M.P. Pop. 1,733.

**Eyebar.** Metal bar with one or both ends enlarged. In the enlarged end a hole is drilled so that by means of a pin or bolt the end of the bar may be secured to another object. Eyebars vary in size, from a fraction of an inch in diameter up to the great eyebars used in the Quebec bridge, each sustaining a pull of 300 tons.

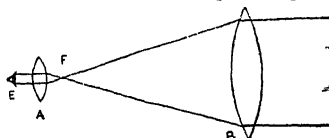
**Eyebolt.** A bolt with one end formed like an eye or rigid ring instead of an ordinary head. Eyebolts are used for many purposes, e.g. as door fastenings and attachments for stays and guys.

**Eyebright** (*Euphrasia officinalis*). Small annual herb of the family Scrophulariaceae. A native of N. Europe, N. and W. Asia, and N. America, it is a parasite upon the roots of grasses, sedges, etc. The leaves are oval or lance-shaped, with cut edges, the flowers small, white, veined with purple, and the middle lobe of the lip yellow. It grows in meadows and on heaths.

**Eyemouth.** Burgh of Berwickshire, Scotland. It stands at the mouth of the little river Eye, 8 m. N.W. of Berwick, and has a railway station. Eyemouth is a fishing centre, for

which industry there is a good harbour, protected on the N. by St. Abb's Head. The town hall is the chief public building. Pop. 2,321.

**Eye-piece.** Lens of a telescope nearest to the eye. In a telescope light falls in nearly parallel rays on the object lens, which throws an image of the field of vision. The eye-piece magnifies this image. Eye-pieces used with astronomical telescopes vary in form. The first telescope made by Galileo had a bi-concave eye-piece such as opera glasses now have. This eye-piece is placed between the object glass and the focus at which the image is thrown. Convex eye-pieces are placed outside the focus. But both kinds colour the light coming from the image owing to



Eye-piece. Diagram showing principle of working. E, eye; A, eye-piece; F, focus; B, object lens

the refraction of the rays. Huygens discovered that this defect might be remedied in the eye-piece by employing two plano-convex lenses, both with the flat sides towards the eye, the larger placed nearer the image, and the smaller nearer the eye. This construction is in general use, except for micrometer eye-pieces, which have spider-webs for measuring the sizes of the different objects. In these eye-pieces the flat sides are turned away from each other. *See* Telescope.

**Eylau** or PRÜSSISCH-EYLAU. Town of the Kaliningrad electoral district of the R.S.F.S.R., northern part of former E. Prussia. It stands on the Psmar. 24 m. S. of Kaliningrad (Königsberg), and is noted for the battle fought here, Feb. 8, 1807, between the French under Napoleon, and the combined Russians and Prussians.

After his defeat at Pultusk, Dec. 26, 1806, Bannigsen, pursued by Napoleon, decided to make a stand at Eylau. In an engagement on Feb. 7, 1807, Bagration and Barclay de Tolly, after several assaults by the French, were forced to abandon the village. In a snowstorm on the morning of the 8th the battle

developed. The emperor could bring into the field only Augereau's and Soult's corps, together with six divisions of Murat's cavalry; his other troops were hurrying up over snow-bound roads. An advance by the French from Eylau was beaten back and the Russians attacked in force against Eylau windmill. Augereau's 7th corps was thereupon ordered by Napoleon to stem the Russian advance. The day was going against the French, and the battle reached a crisis when Augereau's troops, blinded with driving sleet and snow, enveloped by artillery and attacked by infantry, suddenly had a mass of cavalry launched against them. Augereau was hit, and all his colonels and brigadiers were killed or wounded.

The French broke, and were in full flight when Napoleon hurled 18,000 of Murat's cavalry upon the Russians. The effect was decisive. The Russians were scattered, regiments were ridden down in the blinding snow, the squares were broken, 16 standards were taken, and the victorious French stopped only on encountering Bannigsen's reserves. As the afternoon wore on, with the arrival of Napoleon's reserves, the day was won, and Bannigsen retired on Königsberg, having lost 18,000 men and 24 guns. The French lost 15,000 men. Napoleon brought into action altogether 79,000 men; the Russians numbered 75,000. In the Second Great War, Prussisch-Eylau was captured by the Russians, Feb. 10, 1945. *Pron.* Ile-ow.

DEUTSCH-EYLAU lies 68 m. S.E. of Danzig, in the Masurian voivodship of Poland (S. part of former E. Prussia). In the Second Great War, it was captured by the Russians, Jan. 22, 1945.

**Eyot** (A.S. *igath*) or ART. Islet in river or lake, especially one overgrown with willows. *Pron.* eight.

**Eyra.** S. American wild cat. Resembling a large weasel with a long tail, it is reddish brown in colour, without stripes. It ranges from Mexico to Brazil, and is a trouble to the poultry farmer.

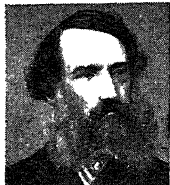
**Eyre.** Word derived from the Latin *iter*, a journey. It is used chiefly in connexion with the itinerant justices sent out by Henry II and known as justices in eyre. In Scotland the form *aire* came into use. *See* Henry II; Judge.

**Eyre.** Lake in S. Australia. It is 4,000 sq. m. in area, but in dry seasons merely a salt marsh. In wet seasons the Borcoo and Diamantine flow into it. E. J. Eyre (*v.i.*) discovered it in 1840.



Eyebright. Flowers and leaves of *Euphrasia officinalis*

**Eyre, EDWARD JOHN** (1815-1901). British colonial governor. Born at Hornsea, Yorks, Aug. 5, 1815, he emigrated to Australia in 1833, and carried out valuable explorations of unknown territory, especially of the coast between Adelaide and King George Sound, in 1841. He went to New Zealand as governor in 1846, to St. Vincent, 1854, and to Jamaica, 1861. His



Edward J. Eyre,  
British explorer

stern handling of the negro rising there in 1865 caused his recall to England, where his action roused wide controversy. In 1872 the government repaid the legal expenses which he had in self-defence incurred, and awarded him a pension, 1874. He died Nov. 30, 1901.

**Eyre, SIR JAMES** (1734-99). English lawyer. Born at Wells, he went from Winchester to S. John's College, Oxford, and became a barrister. He successfully defended John Wilkes in 1763, attacking general search warrants, by which means Wilkes's authorship of No. 45 of the North Briton had been proved. From his post as recorder of London he was promoted in 1772 to be a judge; in 1787 he became chief baron of the exchequer and in 1793 chief justice of the court of common pleas. He remained in office until his death, July 1, 1799.

**Eyre, SIR VINCENT** (1811-81). British soldier. The son of a soldier, he was born Jan. 22, 1811, and educated at Norwich grammar school. He joined the service of the E. India Co. in 1828 and, in the artillery, was with the force that entered Afghanistan in 1840; after the siege of Kabul by the Afghans he and his family were surrendered to them as hostages. In 1843 they were rescued by a relieving force. Eyre commanded the artillery at Gwalior, and during the Mutiny distinguished himself by his prompt action in marching against some rebels at Arrah and defeating them at Jagdespur. He held a command in the force that relieved Lucknow, and retired as a major-general in 1863. He died at Aix-les-Bains, Sept. 22, 1881.

**Eyston, GEORGE EDWARD THOMAS** (b. 1897). British racing motorist. Born June 28, 1897, he went to Stonyhurst and Trinity College, Cambridge. Equally interested in designing and driving cars, between 1931 and 1938 he captured some 250 records for speed

by distance or time. In 1936 with A. Denly he broke every record from 500 m. to 5,000 m. and from 3 hr. to 48 hrs.

He excelled Sir M. Campbell by driving his car Thunderbolt at 311.42 m.p.h., Nov. 19, 1937; and on Sept. 16, 1938, in Utah, attained 357.53 m.p.h. Eyston, who was awarded the Segrave trophy in 1935, edited *Fastest on Earth*, 1939. He was engaged in the Second Great War on naval constructional engineering. *Prom.* Easton.



G. E. T. Eyston,  
British racing  
motorist

**Ezekiel, BOOK OF.** One of the prophetic books of the O.T. Ezekiel was both priest and prophet. With King Jehoiachim and other members of the upper classes of Jerusalem he was deported to Babylonia in 597 B.C. by Nebuchadnezzar (605-562 B.C.). The exiles were settled at different points, Ezekiel becoming a member of the community at Tel-abib, near the river Chebar, which has been identified with the grand canal in the neighbourhood of Nippur. The prophet received his call in the fifth year of the reign of Jehoiachim (592 B.C.).

The book falls into five divisions: (a) the prophet's call and consecration, Ezek. 1, v. 1-3, v. 15; (b) discourses on the imminent destruction of Jerusalem, 3, v. 16-24, v. 27; (c) oracles against Ammon, Moab, Edom, Philistia, Tyre, Sidon, and Egypt, 25-32; (d) prophecies of the restoration of Israel and the overthrow of her foes, 33-39; (e) vision of a restored theocracy of a united Israel, 40-48. The book itself assigns definite dates to many of the prophecies, the latest mentioned being about 570 B.C. Once the prophet admits that a prediction had not been fulfilled, when Nebuchadnezzar was expected to capture Tyre.








The authorship and integrity of the book present no difficulty. The difficulties are associated with the Hebrew text, often obscure and corrupt. As the author was a priest it is not surprising to find that he lays more stress than the other great prophets on externalities, rites, and ceremonies. We find points of affinity with the priestly phraseology of the later legislation, which has been called the Code of Holiness (Lev. 17-26). But due emphasis is laid also upon personal responsibility and personal re-

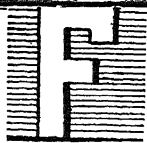
ligion. "Pastor rather than prophet," Ezekiel's visions of the chariot and cherubim (1, v. 1-3, v. 15) had influence on the later symbolical literature. They have been interpreted (e.g., by the Rabbis) as a synopsis of theosophy. The vision of the valley of dry bones in chap. 37 has become famous. In chaps. 38 and 39 occur the curious creations Gog and Magog. Gog, perhaps suggested by Gyges, king of Lydia, is a prince from the land of Magog, who leads a great host of nations against the restored Israel, and is defeated ignominiously. In the later Jewish eschatology Gog and Magog are represented as leading in vain the final attack of the powers of the world upon the Kingdom of God.

**Ezra, BOOK OF.** Book of the O.T. Ezra was a Jewish scribe living in exile in Babylon, under Artaxerxes Longimanus. He is said to have belonged to the priestly line, and to have been a descendant of Seraiah, the high priest when Jerusalem was captured by Nebuchadnezzar. About 458 B.C. he was allowed to return to Jerusalem. There he found that the remaining Jews had intermarried with heathen women, and great laxity prevailed, and he set out to restore worship and order. He started the rebuilding of the Temple, and restored the text of the Jewish law.

The O.T. Book of Ezra is closely related to the Book of Nehemiah, so closely indeed that, as the Talmud and early Christian writers indicate, they form really one work. Closely related to them are the Books of Chronicles, of which Ezra and Nehemiah are a continuation. The threefold work, Chronicles-Ezra-Nehemiah, covers the history of Israel from the period of Adam to the second visit of Nehemiah to Jerusalem in 432 B.C.; but the history is viewed from an ecclesiastical and priestly standpoint.

Ezra-Nehemiah (which together appear in the Septuagint as 2 Esdras) includes the history from 538 B.C., when Cyrus issued a decree permitting Jewish exiles to return, to 432 B.C., when Nehemiah made his second visit to Jerusalem. The Ezra portion records the return of the exiles, the rebuilding of the temple, and the mission of Ezra, who was sent as royal commissioner from Babylonia to Jerusalem by Artaxerxes. Part of the book is written in Aramaic (4, 8-6, 18, and 7, 12-26). Ezra-Nehemiah seems to have been compiled between 300 and 250 B.C.

THE letter F has a more uncertain history than most of its fellows. It is not clearly recognizable in either the Egyptian hieroglyphs or the Semitic alphabets, though some scholars have postulated its evolution from the Semitic *van*, or *hook*. This was related to the ancient Egyptian hieroglyph . In its hieratic form (3000-2500 B.C.) this became , while the Semitic form was  and a Phoenician variant of the same letter (1000 B.C.) gives , which is not unlike an F with a broken back.  However this may be, the letter as we know it is the classical Greek digamma, or double gamma, one being superimposed on another. Another form was . Its resemblance to the letter E therefore  appears to be accidental, stressed only by the juxtaposition of the two in the



Greek and Roman alphabets. Indeed the Greeks' pronunciation of their digamma corresponded to that of our modern *w*. Its labial quality was introduced in the early Latin alphabets, in which a combination of *f* and *h* represented our present pronunciation of *f*.

The *h* was later omitted, as the Latins came to accept the letter *V* as the usual sign for our *w* sound; and the classic Roman *F* therefore signified the sound of *f* as we understand it today. The development of the minuscule letter *f* needs no explanation if one recalls the simplification of inscribed letters into penstrokes; but it is worth noting that Latin cursive writing generally extended the letter below the line, a practice maintained by modern printers in the case of the italic *f*.

**F** Sixth letter of the English and Latin alphabets. It is a hard labial (lip-sound), the corresponding soft sound being *V*. Its ordinary sound is as in *fat*. In the single word *of*, and in its compounds, e.g. hereof, thereof, it is pronounced as *v*. In *halfpenny* both *f* and *l* are mute (hay-penny). A noun ending in *-f* often takes plural in *-ves*; *loaf*, *loaves*. Doubling *f* modifies the sound of the preceding vowel; *chaffing*, *chaffing*. The sound of *f* is also represented by *ph* in words derived from the Greek, as in *philosophy*, *phrase*. See Alphabet; Phonetics.

**F**. In music, the fourth note of the natural scale of C. *F* is only a semitone above *E*, instead of a whole tone. *F* sharp is the first sharp to appear in a key signature—key of G. See Key Signature.

**Faber**, FREDERICK WILLIAM (1814-63). British divine. Born at Calverley, Yorks, June 28, 1814, he



*F. W. Faber*

was educated at Balliol College, Oxford, and in 1843 became rector of Elton, Hunts. In 1845 he succeeded to the Roman Church and four years later became superior of the Oratory of S. Philip Neri, now at Brompton. A popular preacher, he is best known by his hymns, which include *Sweet Saviour, bless us ere we go*; *Hark, hark, my soul*; *Souls of men, why will ye scatter*? Died at Brompton, Sept. 26, 1863.

**Faber**, GEOFFREY CUST (b. 1889). British publisher and writer. Born Aug. 23, 1889, he was educated at Rugby and Christ Church, Oxford, and worked with the Oxford University Press, 1913-14. After the First Great War he became a barrister, and from 1924 chairman of the publishing firm

which bears his name. His first book, *Interflow*, appeared in 1915. Of his later works *Oxford Apostles*, 1933; *A Publisher Speaking*, 1934; and *The Buried Stream*, 1941, were probably best known.

**Fabia**. One of the oldest Roman *gentes* or clans, probably of Sabine origin. They appear to have been originally priests, who took part in the supervision of the festival *Lupercalia* (*q.v.*). They were a patrician clan, whose chief families were those of *Ambustus*, *Labeo*, *Maximus*, and *Pictor*.

**Fabian Society**. The oldest British Socialist organization. Founded in 1884, it was named after the Roman general *Fabius Maximus* (*v.i.*) whose tactics were expressed thus: "For the right moment you must wait . . . but when the time comes you must strike hard." It numbers over 5,000 members and has 100 local societies. Since the days when *Sidney* and *Beatrice Webb* and *Bernard Shaw* were leading members, the society has always exerted political influence, and it was one of the founder organizations of the Labour party, with which it is officially connected. It seeks to encourage Socialists in a high standard of free and independent research. Colonial and international bureaux have been set up in recent years. The offices are at 11, Dartmouth Street, Westminster, S.W.1.

**Fabius Maximus**, *QUINTUS* (d. 203 B.C.). Roman general. He was appointed, with dictatorial powers, to the command of the Roman forces after the defeat by the Carthaginians at Lake Trasimene, 217 B.C. By a series of delaying tactics—whence his surname of *Cunctator* (the delayer)—*Fabius* avoided pitched battles with *Hannibal*, wore down the offensive power of the Carthaginians, and gave the Romans time to consolidate their forces. He thus paved the way for *Scipio's* vic-

tories, which ended the Second Punic War. *Fabian* tactics has come to be used proverbially for a waiting policy.

**Fabius Pictor**, *GAIUS*. Painter of a battle scene, the first recorded Roman painting, on the walls of the temple of *Salus* (Safety) in ancient Rome (c. 302 B.C.). In the reign of *Claudius* both temple and picture were destroyed by fire.

**Fabius Pictor**, *QUINTUS* (c. 225 B.C.). Earliest Roman historian. His writings, which were in Greek, are lost, with the exception of some fragments, but he was one of the authorities used by *Livy*, *Diodorus Siculus*, and *Polybius*. A Latin version was also in existence, whether by himself or a later writer is doubtful.

**Fable** (Lat. *fabula*, story, narrative). Short allegorical story in which generally animals, trees, etc., are endowed with speech and human qualities, and by their words and deeds are made to convey moral lessons. Its invention is frequently ascribed to *Aesop* (*q.v.*), but many fables associated with his name probably originated at a much earlier date in India, where they are known sometimes as the fables of *Bidpai* or *Pilpay*, a traditional ancient Indian philosopher, and sometimes as the work of *Buddha*. Some of the fables traditionally ascribed to *Aesop* are but variants of those found on ancient Egyptian papyri. Many, too, have been traced to the Arabs, by whom they may have been brought from India.

It is probable that tales of a fabulist character are common to most primitive peoples, mark, indeed, a definite stage in race-culture; the addition of a "moral" to any beast tale being a natural development, and not peculiar to one originating writer or people. Of later fabulists the French poet *La Fontaine* is perhaps the most celebrated.

**Fabliaux.** Short tales in verse, almost always octosyllabic couplets, dealing from the comic point of view with incidents of ordinary life. The fabliaux appeared in France in the 12th century, and remained popular for about 200 years. The tales are licentious both in subject and in treatment, frequently satirising priests or women or both in language that is generally coarse, but many of them have real humour and the best are free from objection. The fabliaux were first collected and published by Barbazan in the 18th century, and were re-collected and issued in six volumes by Anatole de Montaiglon and Gaston Raynaud in 1872-90.

**Fabre, FERDINAND** (1827-98). French novelist. Born at Bédarieux, Hérault, Feb. 9, 1827, he studied for the priesthood, medicine, and the law in turn before producing his first novel, *Les Courbezon*, 1862. He died in Paris, Feb. 11, 1898. A moderate realist, he depicted with minute fidelity the people and manners of the Cévennes, as in *Le Chevrier*, and excelled particularly in studies of clerical life, as in *L'Abbé Tigrane*, 1873, and *Mon Oncle Célestin*, 1881.

**Fabre, JEAN HENRI** (1823-1915). A French entomologist. Born at St. Léons, Aveyron, Dec.

21, 1823, he passed early years in great poverty. At 18 he was in charge of a primary school, where he improved his knowledge of mathematics and physics in



Jean H. Fabre, French entomologist

his spare time, and where he bought his first book on entomology. Becoming professor of philosophy in the college of Ajaccio and in 1862 at the lycée at Avignon, he turned his attention to the study of insects. His earliest observations appeared in the *Annales des Sciences Naturelles*, 1855-58, subsequently enlarged in *Souvenirs Entomologiques*, 10 vols., 2nd ed. 1914, etc. He died Oct. 11, 1915.

Fabre's earlier volumes are remarkable for their close and painstaking observations on living insects, bringing to light many unsuspected habits and instincts of wasps and bees in particular. His work, though gaining the praise of Darwin, failed to win popular attention. But the reputation of the insect's Homer, as Fabre has

been called, has steadily increased. A curious blend of Gilbert White and Darwin, he not only displays amazing powers of minute and careful observation, but his writings have an unusually high literary quality. *Consult Works*, complete Eng. trans. A. Teixeira de Mattos, 1912, etc.

**Fabre d'Eglantine, PHILIPPE FRANÇOIS NAZAIRE** (1750-94). A French revolutionary and dramatist. Born at Carcassonne, July 28, 1750, he became a member of the National Convention and for a time was secretary to Danton. He had been an actor, and his play *Philinte* attracted some attention in 1790, but perhaps his most successful literary achievement was the renaming of the months for the revolutionary calendar, 1793. He was guillotined with Danton and his friends on a false charge of forgery, April 5, 1794.

**Fabriano.** City of Italy, in the prov. of Ancona. It stands on the E. slopes of the Apennines, at an alt. of over 1,000 ft., 45 m. by rly. S.W. of Ancona, and is the rly. junction for Urbino. It has a cathedral and town hall, and some of the churches contain pictures of the Fabriano school. The city is celebrated for its paper mills, established in the 13th century. Gunpowder, glue, parchment, and felt are also made, and there is trade in cattle and cereals. The hospital of Jesus and bishop's palace were damaged in the Second Great War.

**Fabric** (Lat. *fabrica*, workshop). Term originally applied to a cloth made by weaving or felting, but now more generally used for the manufacture or texture of anything. In aeronautics, fabric is the linen, treated with "dope" or other preservative, often used for the outer covering of aircraft fuselage and wings. The word is also applied to the outer body of a building, e.g. a church, or figuratively to any system of united parts, e.g. a national constitution, human society, or a religious denomination.

**Fabricius, GERONIMO** (1537-1619). Italian anatomist. Known as Fabricius ab Acquapendente, he succeeded Fallopius in 1562 as professor of surgery and anatomy at Padua, where his great knowledge of comparative anatomy enabled him to introduce improvements into applied surgery. His *Opera Chirurgica*, 1617, was widely read. One of the founders of embryology and an excellent anatomist, he discovered the valves in the veins, and so led William Harvey, who studied under him, to

consider the circulation of the blood. Fabricius died May 21, 1619.

**Fabricius, JOHANN ALBERT** (1668-1736). A German classical scholar. Born at Leipzig, Nov. 11, 1668, at the age of 25 he removed to Hamburg, where shortly after publishing his *Bibliotheca Latina*, 1697, he became a professor at the gymnasium. His later works on classical bibliography, storehouses of learning and still indispensable, included *Bibliotheca Graeca*, 1705-28; *Bibliotheca Ecclesiastica*, 1718; and *Bibliotheca Latina Mediae et Infimae Aetatis*, 1734. He died at Hamburg, April 30, 1736. *Pron.* Fab-reets-ious.

**Fabricius Luscinius, GARUS** (fl. 280 B.C.). Roman general. He won notable victories over the Lucanians, Bruttians, and Samnites, and in the war with Pyrrhus twice conducted negotiations with that monarch. After the Roman defeat at Heraclea in 280 B.C. Pyrrhus tried hard to buy Fabricius over, but the stern Roman was incorruptible. Later, after Fabricius had delivered up a traitor who had offered to poison Pyrrhus, negotiations were resumed, with the result that in 278 satisfactory terms of peace were arranged. During his censorship in 275 he made great efforts to check the growing tendency to luxury and extravagance. He himself died so poor that his daughters had to be provided with dowries by the state. Fabricius was lauded by subsequent generations as the embodiment of the old republican virtues. *Pron.* Fab-rish-ius.

**Fabritius, CAREL** (c. 1624-54). Dutch painter. A pupil of Rembrandt, he lived in Delft. Little is known of his life, and his pictures were few. His *Portrait of a Man*, in the Rotterdam museum, was for long attributed to Rembrandt. His most famous work, *The Goldfinch*, was in the *Maurits-huis* at The Hague, though *The Family Group*, destroyed by fire, was accounted his masterpiece. There were several portraits by him in German galleries, and one of a soldier in the National Gallery, London. His most famous pupil was Vermeer (q.v.) on whom his influence is apparent. Fabritius perished in a powder magazine explosion at Delft, Oct. 12, 1654.

**Fabrizi, NICOLA** (1804-85). An Italian patriot. Born at Modena, April 4, 1804, he was implicated in the Carbonari insurrection of 1831. He fled to Marseilles and thence to Spain, where he fought against the Carlists, 1837. One of Mazzini's

most trusted agents, he moved to Malta, whence he assisted the Sicilian insurrection of 1848. When revolution broke out in Italy, he fought at Venice and Rome, retiring to Malta after the fall of Rome. He raised a revolt in Sicily in 1860 and joined forces at Palermo with Garibaldi, who made him governor of Messina and war minister. He opposed Garibaldi's Rome campaign of 1862, but in 1867 fought at Mentana. He died March 31, 1885. *Pron.* Fab-reet-si.

**Fabroni**, ANGELO (1732-1803). Italian biographer, called "the Plutarch of modern Italy." Born at Marradi, Tuscany, Sept. 25, 1732, he became prior of San Lorenzo, Florence, in 1767, and was appointed tutor to the sons of Leopold, grand duke of Tuscany, in 1773. His chief work was *Vitae Italarum Doctrina Excellentium qui Saeculis XVII et XVIII floruerunt*, in 20 vols., 1778-1805, vol. 19 containing his autobiography. He also wrote biographies of Lorenzo de' Medici, 1784; Cosimo de' Medici, 1788-89; and Petrarch, 1799. He died Sept. 22, 1803.

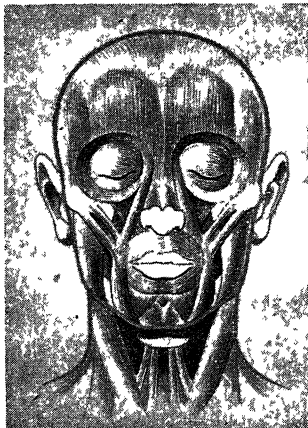
**Façade** (Fr.). Architectural front of any building or part of a building. Not necessarily confined to the principal front, the term is mostly used in connexion with street architecture, where one face of the building is mainly important. A façade is, strictly, a front in one plane. Thus a front with one or more pavilions projecting from its surface could not be referred to as a single façade, each pavilion having its own façade. *See* Architecture.

**Face.** The front of the head. The face may be divided into the regions of the forehead, temples, ears, eyes, nose, mouth, cheeks, and upper and lower jaws. The bones of the face are fourteen in number, twelve being in pairs, namely the superior maxillary, malar, nasal, palate, lachrymal, and inferior turbinated bones. The palate bone is situated deeply in the region of the mouth and nose. The mandible or lower jaw and the vomer, part of the septum dividing the nose into two parts, are single bones.

Besides these bones, some of the bones assigned by anatomists to the cranium also take part in the formation of the face, namely the frontal, parietal, sphenoid, and temporal bones. The forehead is formed by the frontal bone. Underlying the scalp is the frontalis muscle, contraction of which causes the furrows which appear on the forehead when the brows are lifted to express surprise. Running up

on each side of the forehead is the temporal artery which is often prominent and well marked, owing to thickening of the walls of the vessel, an indication of senility of the vessels. The superciliary ridges are bony prominences above the eyes, best seen in adult males. These ridges were strongly developed in certain prehistoric forms of man, particularly Neanderthal man. Vertical furrows seen in the act of frowning are produced by a small muscle, the *corrugator supercilii*.

The eyeball is situated in a bony framework known as the orbit, which, together with the projection of the nose, serves to pro-



Face. Diagram showing the muscles of expression in the human face

tect it from injury. The aperture between the eyelids is known as the palpebral fissure. The nose is divided into two parts by a septum formed partly of bone and partly of cartilage, the junction of the two being marked by the bridge of the nose. The outer angle of the orbit is prolonged towards the ear into a bridge of bone known as the zygoma. The temporal muscle occupies a fossa forming the greater part of the temporal region, its tendon passing beneath the zygoma to be attached to the lower jaw. This muscle takes part in the act of mastication, and can be felt contracting when the mouth is firmly closed. The anatomical features of the ear, nose, and mouth are described under their respective headings.

The principal nerves of the face are the fifth or trigeminal nerve, which is the main sensory supply to the face, and the seventh or facial nerve, which supplies most of the muscles of the face. The

face is well supplied with blood-vessels, which explains the profuseness of haemorrhage following injury to the tissues.

**Face Conveyor.** Machine used for the transport of coal. The transport of coal from the point where it is cut out of the working face comprises three stages—from the face to the main haulage way; the main haulage to the foot of the shaft; the raising of the coal to the surface. The first stage is relatively costly, and often difficult on account of the limited space available, and particularly the low roof. Face conveyors have been introduced to perform it.

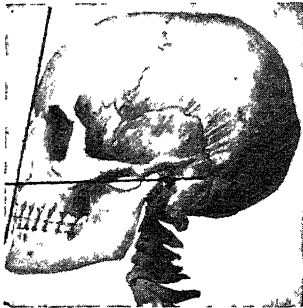
The jiggig conveyor consists of a long steel trough suspended on short arms in such a way that the trough can be "jiggled" to and fro. Coal is shovelled on to the trough, and at each stroke or movement is thrown or jerked bodily forward a short distance until finally thrown off the end of the conveyor. The chain conveyor consists of a fixed trough or bed along which a chain is drawn. The chain is composed of bars of steel, forming links and cross-pieces all of which have their faces vertical. The coal is thrown on to the chain, the large pieces being carried along on the tops of the links and cross-pieces, while the small drop through the chain to the bottom of the trough, and are scraped forward by the under edges of the chain. These machines can be moved forward as the working face is extended. Driven either by compressed air or electrically, one can remove 360 tons from a face of 100 yards in eight hours. *See* Conveyor.

**Face Value.** Nominal value of debentures, stocks, shares, and securities generally, as opposed to their real or market value. For instance, the face value of Consols is in £100 and multiples of £100, and of an ordinary share in the Amalgamated Press 10s., although in each case the selling value is very different.

**Fâcheux**, LES (The Bores). Three-act or comedy-ballet masque by Molière. Written and played within a fortnight, it was first produced in the garden of Fouquet's residence, Vaux-le-Vicomte, Aug. 17, 1661. It displays ten bores, satirical portraits from society, who prevent an ardent young lover from speaking with the object of his devotion. It was the first play written by Molière for Louis XIV, and the first play of its kind to be produced on the French stage.



**Facial Angle.** A method of measuring the facial profile, especially in man and the anthropoid apes. The earliest, Pieter Camper's (c. 1770), was subtended by two lines (1) drawn from the glabella to the upper jaw, (2) drawn in a plane passing through the



Facial Angle. Diagram showing a method of measuring the facial profile

base of the nose and the centre of the aural orifice. This measures  $40^\circ$  (orang-utan),  $70^\circ$  (negro),  $80^\circ$  (European). Camper's angle is now superseded.

**Facial Nerve.** Seventh cranial nerve. It supplies most of the muscles of the face, and the sense of taste in the anterior part of the tongue. Paralysis of the facial nerve (Bell's Palsy) is most often due to inflammation of the fibrous tissue surrounding the nerve where it leaves a narrow canal bone, the nerve thus strangulating itself. It is most commonly caused by exposure to cold. At sudden onset the face is drawn over to the opposite side, while on the affected side the eye cannot be closed, the lower lip drops, and the forehead cannot be wrinkled. Within a time limit of 2 days to 2 years the recovery from paralysis begins, and recovery is usually complete. Salicylates and iodides are useful drugs, while galvanic stimulation helps the tone of the inactivated muscles. Eventually the surgeon may have to relieve the nerve of the constricting pressure.

**Facility** (Lat. *facilis*, easy). Ability to perform anything easily. In Scots law it has a special meaning: a condition of mental weakness that falls short of idiocy. The person suffering from this condition is one easily persuaded.

**Factor** (Lat. *maker*). In mathematics, any of two or more numbers or expressions which when multiplied together produce a given number or expression. Thus 7, 3, 2 are factors of 42 and  $(a+b)$ ,  $(a-b)$  of  $a^2-b^2$ . A factor which can be divided only by itself and unity is called a prime factor. The

factor of the greatest degree which is common to two algebraic expressions is called the highest common factor. In arithmetic the highest number which is a factor of two or more numbers is called the greatest common divisor. See Mathematics.

**Factor** (Lat. *facere*, to make). Word meaning an agent, but in a special sense an agent who buys and sells for a principal. He carries on business in his own name, but differs from a broker in that he usually handles the goods in which he deals and transfers them to his principal: moreover, he has a greater latitude about buying and selling. In English law several statutes have regulated the relations between a factor and his employer, these having been consolidated by the Factors Act of 1889. Much, however, is left to custom, and this differs obviously very much between one trade and another. The main provision of the Act gives a valid title to a person who in good faith buys from a factor goods which are in the factor's possession with the consent of his principal.

Factor in Scotland is a man who manages an estate, a land agent. A judicial factor is one appointed by a court of law to manage the estate of a minor or imbecile.

**Factor of Safety.** Ratio of the ultimate strength of a structure, or part of a structure, to the normal load which it carries under the conditions for which it was designed. Where accident may involve injury to human beings, a high factor of safety is usually prescribed by law. The wire rope used for winding men in pit cages must have a factor of safety of from 8 to 10, i.e. the rope must be strong enough to carry 8 to 10 times the normal load.

**Factory.** Building or assembly of buildings devoted to the manufacture of goods. Factories are defined by the Factories Act, 1937, as any premises in which persons are employed in manual labour in any process for or incidental to (a) the making of any article or part of an article; (b) the altering, repairing, ornamenting, finishing, cleaning, washing, or breaking up or demolition of any article; or (c) the adapting for sale of any article. This definition abolishes the old distinction between textile factories, non-textile factories, and workshops. This Act (*v.i.*) is a complete code covering the safety, health, and welfare of all persons employed in factories as well as regulating the hours of employment of women and young persons.

In planning a factory the builder's first consideration is the site. In heavy industries proximity to raw materials may govern the choice, though this factor may be overborne by convenience of transport or access to markets. Coal being a prime necessity for most industries, the coalfield areas have in the past attracted a large proportion of works, but with the adoption of electric power this is not now such a great matter. The wide use of this power and the value of being near the chief market have caused a movement of British lighter industries into the neighbourhood of London. For chemical works, where salt, lime, or other deposits are prime necessities, it is cheaper to erect the buildings over these deposits even at the cost of transporting the coal.

The usual modern factory consists of a group of light, well ventilated, single-storey buildings, so constructed that they can be readily expanded or adapted. For some processes, e.g. flour milling, a multi-storeyed building may be the most economical. Proximity to railways, roads, and waterways is an obvious requirement. Other needs are firm foundations away from marshy ground or underground workings, and accessibility of workers, particularly those of traditional skill, as in the manufacture of cutlery, steel, and pottery. In old days, climate influenced choice of site; the cotton industry was favoured by the damp of Lancashire; but air control and air conditioning have made natural climate less important. The buildings are so designed that the flow of work is continuous from intake of raw material to outflow of finished goods. Internal transport of goods is reduced to a minimum and mechanised as far as possible. Lifting gear and labour-saving devices are profitable, e.g. belt conveyors, mechanised trucks, travelling cranes, and even light railways. The principle of mass production is to bring the work to the several workers and so break down the job that each worker is engaged on a small operation. The resulting monotony raises problems of the welfare of the worker.

Increased use of electricity as a motive power has increased the flexibility of lay-out, and has improved the appearance and safety of workshops by abolishing large driving belts and shafting; while the extension of the grid system throughout the U.K. has relieved many of the lighter

industries of the necessity of generating power on the premises.

Generous expenditure and vigilant economy are both required to ensure success. The best firms do not hesitate to put back into the business large capital expenditure on new machines, lay-out, and buildings. Much saving has been effected by the utilisation of waste and by-products. Scarcity of fuel during the Second Great War led to further economies by the use of warm water from steam condensation, of rubbish as a source of heat, and the lagging of furnaces and boilers. Coal tar, once thrown away in the process of preparing coal-gas but now of greater value than the gas itself, is the classic example of a by-product. Sheets of tinned iron scrap from tinplate factories, formerly discarded as useless, are now chemically stripped and the recovered tin is used again.

#### Division of Work

The work in a factory is technically divided into two classes: (a) the actual process of manufacture, and (b) the services which facilitate it. The latter, subsidiary branch comprises the supply of power, maintenance of buildings, repair of tools and machines, packing and labelling finished products, and the care of the workers. A typical factory includes most or all of the following departments:

(a) *Manufacture*: Receipt and storage of raw material; actual manufacture in successive stages; finishing and assembling; packing, labelling, and analysis; dispatch. (b) *Services*: Transport by road, rail, or water; power (including water services, light, heat, and motive force—hydraulic, steam, or electrical); engineers' shop and stores; social service (rest rooms, canteens, etc.); time-keeping; accountancy; store-keeping.

Each manufacturing department is restricted to a single phase of the complex process of converting raw material into finished product. To coordinate the output of all these independent parts, so that none is kept idle by any other, requires the closest care. It is upon fine adjustments and economies that the margin of profit often depends. Under the general control of departmental managers, a foreman is in charge of each workshop and responsible for its output.

The length of the working day or week that will scientifically give maximum output varies with the individual and with the industry, but the war years showed that excessive hours of work do not produce commensurate output.

An increase in the care given to the welfare of the workers is one of the social advances arising out of wartime experience. Many firms improved conditions after the First Great War, supplying rest rooms, medical supervision, first-aid rooms, canteens, and recreational facilities, with the help of voluntary societies.

Wilfrid Garrett

**Factory Acts.** In the United Kingdom, a series of over twenty statutes, aimed at regulating conditions in factories and workshops, especially on behalf of women and children. The first was passed in 1802, Addington's Act, "for the preservation of the health and morals" of apprentices, etc., employed in cotton and other factories; child employees were not allowed to work more than 12 hours a day nor later than 9 p.m., and had to be taught the three Rs in working hours.

The Act of 1833 barred the employment of children under nine years of age at factories and provided *inter alia* for an eight-hour day for children under 13, for certain holidays, and for factory inspectors. The 1844 Act initiated the following interpretations, viz. "young person," between 13 and 18 years old; child, under 13 years; it laid down that women were to be employed on the same conditions as to hours as young persons, who, together with children, were not to work on Saturdays after 4.30; and regulated the fencing of machinery. The 1847 Act set up an eleven-hour day maximum for factory workers and a ten-hour day for women and young persons, with a 58-hour maximum for the week.

Lord Ashley (earl of Shaftesbury) was perhaps the most prominent of the reformers of abuses which for years disfigured the industrial system in the 19th century. Other Factory Acts were passed at intervals to safeguard the workers further from accident, disease, or oppression, and to provide for the education of children employed at factories before national education was adopted.

The Factories Act, 1937, consolidated the law, incorporating and amending the provisions of the Factory and Workshop Act, 1901, and later Acts. It contains general provisions as to health, safety, and welfare: including, under health, cleanliness, overcrowding, temperature, ventilation, lighting, drainage, sanitary conveniences; under safety, prime movers, transmission, construction and sale of new machinery, vessels containing dan-

gerous liquids, cleaning of machinery by women and young persons, hoists, lifts, chains, ropes, cranes, construction of floors, passages, and stairs, safe means of access, safe place of employment, dangerous fumes, explosive or inflammable dust or vapour, fire escape and precautions; under welfare, drinking water, washing facilities, first aid, space for clothing.

#### Welfare and Health Provisions

The Act next sets out special provisions as to health, safety, and welfare applicable to certain industries and processes dealing with the removal of dust or fumes, meals in dangerous trades—e.g. where lead or arsenic is used—protection of eyes by goggles or screens where there is a risk of injury from particles or fragments, installation of hydrometers in humid factories, the prohibiting of artificial humidification in underground rooms, basements, bakehouses, and laundries, lifting excessive weights, employment of women and young persons in certain processes. There are rules for the notification and investigation of accidents and industrial diseases, and concerning home work and piece work.

An abstract of the Act must be posted at the principal entrances of a factory. The Act is reinforced by detailed regulations made by the Home secretary. Failure to observe it is a criminal offence.

**Factory Inspector.** Class of British civil servants attached to the ministry of Labour. The inspectors are responsible for the proper administration of the Factories Act. They may enter and inspect a factory at any reasonable hour of the day or night, and may require the production of registers, certificates, etc. It is an offence to obstruct an inspector.

**Faculae** (Lat. *facula*, small torch). Areas of the sun's surface hotter and therefore brighter than the remainder. Dark sunspots are nearly always surrounded by facular areas, but faculae may appear unaccompanied by spots. These often mark disturbed regions which have given or are about to give rise to sunspots. See Sun.

**Faculties, COURT OF.** Court held on behalf of the archbishop of Canterbury to deal with cases arising from the legatine powers of the archbishop, administered partly by him personally and partly by the master of the faculties. These powers are concerned with the granting of special and ordinary licences for marriage in both provinces, Canterbury and York; the issue of dispensations to hold

two benefices in plurality; conferring Lambeth degrees; and the appointment of notaries. When disputes arise an appeal lies to the court of faculties, presided over by the dean of the arches, who is also the judge of the court of arches, the provincial court of Canterbury. The registrar's address is 1, The Sanctuary, Westminster, S.W.1. See Ecclesiastical Courts.

**Faculty** (Lat. *facultas*, faculty, ability). Any special mental power, e.g. the faculty of speech. This use of the word has come down from the early philosophers. Derived obviously therefrom is the use of the word for a department of a university, and for its instructors; thus in modern universities we have the faculties of arts, medicine, law, theology, science, etc. Similar is its occasional application to the members in a collective sense of a learned profession, e.g. the faculty of advocates in Scotland. In the U.S.A. the teaching staff of a university or college is called the faculty.

In English ecclesiastical law and usage the term means a permission to do something which is not allowed by the common law: e.g. to be married otherwise than after the publication of the banns, or to make an alteration in a church. For such matters as the altering of churches, putting up monuments, etc., therein, each bishop deposes his chancellor to hear the application. See Ecclesiastical Law.

**Fadden, ARTHUR WILLIAM** (b. 1895). Australian politician. He was born April 13, 1895, and entered politics in 1936 when he was returned to the house of representatives as member for Darling Downs, Queensland. He became minister for air in Aug., 1940, and commonwealth treasurer soon afterwards. Fadden succeeded R. G. Menzies as prime minister in a coalition government in Sept., 1941, but commanded no majority and resigned the next month after a vote of censure on the budget. He then led the opposition until 1943 and thereafter the Country party. In the Menzies 1949 cabinet he was again treasurer.

**Fading.** Term applied to the weakening of signal strength in radio reception. In medium and long wave transmissions the signal can travel to the receiver by two paths: the ground-ray comes direct, the sky-ray goes diagonally upwards and is reflected down again by the Heaviside layer (q.v.). Since these paths are of different lengths the waves may arrive in different phases and

interfere. Where the two rays are of much the same strength, and a trough in the one coincides with a crest in the other, they will cancel out and the signal fade. Since the effective height of the Heaviside layer depends on the radiation received from the sun, fading varies from day to night and from winter to summer, and shorter fluctuations (from 1/100 sec. to 15 min.) occur as a result of magnetic disturbances connected with sun spots. Fading in short wave transmissions is the result of interference between two or more sky-waves coming by different paths. Rapid fluctuations may wreck all long distance radio-communications during high sunspot activity.

**Faed, THOMAS** (1826-1900). A Scottish painter. Born at Gatehouse of Fleet, Kirkcudbrightshire, June 8, 1826, he studied art at Edinburgh, and painted many scenes of Scottish life, humorous and pathetic. A.R.S.A. in 1843, he came to London in 1852, and became A.R.A. in 1861, and R.A. in 1864. He died, Aug. 17, 1900, almost blind, at St. John's Wood. His *Faults on Both Sides*, *Silken Gown*, and *Young Highland Mother* are in the national collection, at the Tate Gallery.

**Faenza** (anc. Faventia). City of Italy, in the prov. of Ravenna. It stands on the Lamone, 31 m. by rly. S.E. of Bologna. Surrounded by medieval walls, it has for centuries been famed for its art pottery called "faience" (q.v.). On the principal square are the cathedral (1474), the former palace of the Manfredi, now the city hall, and the church of S. Michele. There is an arcaded market-place, and the municipal art gallery has frescoes, sculptures, and fine specimens of local majolica. Silk spinning, weaving, and sulphur refining are carried on. Founded by the Romans, Faventia was the scene in A.D. 542 of the defeat of the Byzantines by Totila, and was prominent in the medieval wars of the Guelphs and the Ghibellines. Captured in 1240 by Frederick II, Faenza fell successively to the Manfredi, the Borgias, Venetians, and the popes. Used as a German military base late in 1944, Faenza was captured by New Zealand troops of the 8th army on Dec. 16. Several palaces and museums were damaged in the battle, the Germans bitterly resisting the Allied forces. Pop., pre-war, 22,400.

**Faerie Queene, THE.** Poem by Edmund Spenser, published in 1590-96. The published poem consists of six books, divided into 12

cantos, between 50 and 60 stanzas in each canto, and is written in nine-line stanzas, each ending with a twelve-syllable line. The poem blends the Arthurian legend of knights errant with classical lore, Christian teaching, and allegory, both general (concerning the virtues and vices) and particular (concerning people of the poet's time). Devised as an allegory on a grand scale, and only half completed, it remains a wonderful medley of poetic romance, shot through with threads of allegory, full of descriptive beauty and rich verbal music.

**Faeringehavn.** Harbour on the S.W. coast of Greenland, opened in Dec., 1937. The harbour is free of pack-ice for the greater part of the year. Enlarged and provided with modern loading equipment, it became an important base during the U.S. occupation of Greenland in the Second Great War.

**Fafnir.** The treasure-guarding worm or dragon of Scandinavian and Teutonic mythology. In both a smith's brother is supposed to have been transformed into this form. In the Scandinavian *Volsung Saga*, Sigurd slays Fafnir, guardian of Ardvara's hoard, and is thereafter known as Sigurd Fafnirsbane; while in the *Nibelungen Lied* Siegfried kills Fafnir, who guards the Nibelung hoard.

**Fagaceae.** Family of trees. The fruit is enclosed in a cup. The family includes sweet chestnut (*Castanea*), oak (*Quercus*), beech (*Fagus*).

**Fagan, JAMES BERNARD** (1873-1933). British dramatist. He was born May 18, 1873, and educated at Clongowes Wood College and Trinity College, Oxford. He was trained as an actor under Benson and Tree, and his first play, *The Rebel*, was performed in 1899. It was followed by *The Prayer of the Sword*, 1904; *Under Which King*, 1905; *The Earth*, 1909; *A Merry Devil*, 1909; *And So to Bed*, 1926; *The Greater Love*, 1927; *The Improper Duchess*, 1932. Fagan returned to acting in 1913, and was long associated with the Playhouse, Oxford. He died in Hollywood, U.S.A., Feb. 17, 1933.

**Fagging.** Old-established system at English public schools under which the older boys are empowered by the school authorities to exact certain duties from the younger boys. The duties, formerly heavy, now consist of running errands, tidying studies, etc., and games fagging. The system, sometimes elaborately organized, varies at different schools. All boys are liable to fagging until they reach a certain form or have been

at the school a certain length of time. As a rule the prefects alone are entitled to fags, but some schools extend the privilege to the sixth form and also to the cricket eleven and football team.

**Faggot** or **FAGOT**. Term used in iron making. In one method of making wrought iron, a rough box of scrap or muck bars is filled with a mixture of iron and steel scrap. This faggot is then reheated and rerolled to expel more slag. The same term is used in the manufacture of shear steel; blister bars are hammered down at red heat to plated bars, which are then piled in groups of six, forming a faggot.

**Faggot Voter**. Name given to a class of voters, now non-existent, at elections in England. The main qualification for a vote in the counties was the ownership of land worth 40s. a year. When the system was instituted in the 15th century this meant a considerable estate, but in the 18th century it meant little. Landowners therefore gave patches of ground to their servants on the implied condition that they voted as their masters wished, a practice not destroyed till the Reform Act of 1834.

**Fagin**. Character in Dickens's novel *Oliver Twist* (*q.v.*). A disreputable old Jew, he is a prominent member of the criminal gang to which Bill Sikes belongs, his special province being the training of young boys to be pickpockets.

**Faguet, ÉMILE** (1847-1916). French critic and literary historian. Born at La-Roche-sur-Yon, Dec. 17, 1847, he became professor of poetry at the university of Paris, 1897, and a member of the Academy, 1900. His writings, which are characterised by a catholicity of taste and a flexibility of judgement reminiscent of Sainte-Beuve, include *La Tragédie au XVIe Siècle*; a series of studies of great French authors of the 16th, 17th, 18th, and 19th centuries; *Politiques et Moralistes du XIXe Siècle*; and monographs on Voltaire, Flaubert, and Zola. He died June 6, 1916. Consult *Émile Faguet*, A. Seché, 1904.

☉ **Fa-Hien** or **FA-HSIEN** (*f.* A.D. 400). Chinese traveller and antiquary. A Buddhist monk, he set out in 399 from the ancient capital Hsian-fu, Shensi, for a prolonged pilgrimage in the Buddha's cradleland. Traversing the Gobi desert, mostly afoot, to Khotan, he crossed the Hindu Kush into the Afghan valleys, and remained ten years, visiting Peshawar and the Ganges cities. He proceeded by sea in 412 to Ceylon, whence he

returned home in 414, with numerous pictures, images, and books. The account of his pilgrimage was translated into English by H. A. Giles, 1923.

**Fahlum** or **FALUN**. Town of Sweden, capital of the govt. of Kopparberg. It stands near Lake Runn, 57 m. by rly. W. of Gävle. The town was burnt down in 1761. Its only notable feature is the 14th century church, which escaped the fire. Minor buildings include the town hall, a mineralogical museum, and technical schools. Its copper mines, once the richest in Europe, now nearly exhausted, have been worked for six centuries, and the company owning them has existed since about 1345. Iron pyrites, gold, silver, and sulphur are still produced. Fahlum has railway wagon works, wood pulp factories, and textile industries. Pop. 15,327.

**Fahrenheit, GABRIEL DANIEL** (1686-1736). A German physicist. Born at Danzig, May 14, 1686, he spent his life chiefly in England and Holland, where he studied physics and constructed meteorological instruments. His name is commemorated by a thermometric scale. He died in Holland, Sept. 16, 1736.

**Fahrenheit Thermometer**. A scale for measuring heat invented by G. D. Fahrenheit. He obtained temperatures 32° below the freezing point of water, and fixed that degree of cold as the zero of his scale. The freezing point of water thus became 32° F. The difference in temperature between this and the boiling point of water Fahrenheit divided into 180 degrees, so that the latter is 212° F.

The Centigrade scale of temperature has the melting point of ice for its zero, and the boiling point of water is fixed at 100 degrees. Réaumur's scale (used in Germany) divides the difference between the freezing and boiling points of water into 80 degrees. To convert these scales:

$$F = \frac{9}{5} C + 32 = \frac{5}{9} R + 32 \\ C = \frac{5(F-32)}{9} \quad R = \frac{4(F-32)}{9}$$

See Centigrade; Thermometer.

**Faidherbe, LOUIS LÉON CÉSAR** (1818-89). French soldier. Born at Lille, June 3, 1818, he entered the engineers in 1840. Almost at once he saw service in Algiers, and in 1854 he was appointed governor of Senegal. France was entering upon her policy of acquiring colonies in Africa, and of this Faidherbe was a pioneer. Made general in 1863, he returned to France in 1870 to lead the armies of the north after the

disasters at Sedan and Metz. He showed great ability when fighting a number of battles against heavy odds, but at last he was beaten at St. Quentin, Jan. 19, 1871. For a short time he sat in the national assembly, and in 1879 he was elected to the senate. Faidherbe was also an Egyptologist. He died in Paris, Sept. 28, 1889.

**Faidit, GAUCELM** (c. 1159-1216). A French troubadour. Born at Uzerche in Limousin, the son of an artisan, he attracted by his singing the patronage of Richard Coeur de Lion. About 70 of his poems have been preserved, including a beautiful *planh*, or song of sorrow, in memory of Richard.

**Faience**. Term loosely used to designate every description of glazed pottery and earthenware painted with decorative designs. The name comes from the Italian city of Faenza, which has made a speciality of this kind of ware from the close of the 13th century. It had a soft paste and thin transparent glaze, which heightened the colours. The very rare French Oiron ware is called Henry II faience. Some varieties from Josiah Wedgwood's work are styled English faience. See Pottery.

**Failsworth**. Urban dist. of Lancashire, England. It is 4 m. N.E. of Manchester, with a rly. station. In the Manchester area, although just outside the city boundary, its main industries are connected with the manufacture of cotton. Gas and water are supplied from Oldham. Pop. 16,650.

**Fainting** or **SYNCOPE**. Temporary unconsciousness due to insufficient supply of blood to the brain. Among causes leading to the condition are defective action of the heart, sudden violent emotion, over-exertion, loss of blood, blows on the head or abdomen. A person about to faint feels giddy, and everything around him seems to be becoming dark. He turns pale, the pupils dilate, the skin becomes cold, and if standing he falls heavily. The pulse is weak and hurried.

Recovery is usually rapid. So long as he is unconscious, the person should be allowed to lie quietly on his back with his head as low as possible, and the clothing about the neck and chest should be loosened. If a person faints in a room the window should be opened, and if outside, onlookers should be sent away. Smelling salts may be held beneath the nose, but until consciousness returns nothing should be given by the mouth. When swallowing is possible, a little brandy or sal volatile in water

may be given. When feelings of faintness first come on, complete loss of consciousness can often be prevented by the person bending forwards and placing his head between his knees at as low a level as possible.

**Fair** (Lat. *feria*, holiday). Periodical assembly of traders at a place and time fixed by charter, statute, or immemorial custom. In early times certain localities came to be used for the periodical exchange of commodities, either by reason of their situation or because they were resorted to at stated times for religious or other purposes. In Greece the Olympic games and such religious festivals as those of Delos and Delphi provided occasions for trading. Among the Incas of Peru fairs were held thrice a month in the most populous places and were visited by the outlying agricultural populations. In ancient Mexico, fairs took place every fifth day in the chief cities.

The earliest royal charter for a fair was granted in 642 by the Frank king Dagobert to the monks of S. Denis, Paris. The concourse of worshippers at a famous shrine afforded great opportunities for trade, and nearly all medieval fair charters were granted to ecclesiastics. The fairs were usually held on a saint's day and on its vigil and morrow, and often, until prohibited by statute, in the churchyard. The religious associations of medieval fairs are indicated by the German word for "fair," *Messe* (mass), and in the term *kermesse* or *kirmess* (church mass) used for the quasi-religious carnivals of Brittany and the Low Countries. In every fair there was a court specially appointed for settling disputes, called in England pie-powder courts (*q.v.*).

#### Fairs and Trade

To promote trade, fairs were encouraged by the sovereigns of Europe. During fair time in the 10th century Otto the Great pronounced the ban on breakers of the peace and suspended the right of private feud. In the 14th century the emperor Charles IV's charter for the great fair of Frankfurt-on-Main declared fair-goers free from arrest and imperial taxes during the fair as well as for 18 days before and after.

Though fairs were invaluable for international trading, local traders were usually compelled to close their shops in fair time. During the Westminster fair the city tradesmen were commanded to shut their shops, and during the fair on St. Giles's Hill, near Winchester, which lasted 16 days, the Winchester and the Southampton shopkeepers were only allowed to

trade in the fair. The bishop of Winchester was the lord of the fair, and while it lasted the powers of the regular city officers were in abeyance. On the Eve of S. Giles the keys of the city gates were handed over to the bishop, who appointed a mayor, bailiff, and coroner of his own for the duration of the fair.

The influence of country fairs was far-reaching. In 1338 the statutes of St. Mary Ottery's College in Devonshire ordained that 200 lb. of wax for the choir should be bought annually at Winchester fair. In the 15th century the monks of Maxstoke and Bicester laid in their yearly stores at Stourbridge fair, and in the 16th century it was still customary for stewards of country houses to purchase their year's supply of household stores at remote fairs. With the improvement in communications the importance of fairs diminished, and by 1855 all those in London were abolished.

#### "Fun of the Fair"

Amusements formed an important feature of fairs, many of which became mere disorderly revels and were suppressed as nuisances. This was the fate of Donnybrook fair in Dublin, of Charlton or Horn fair, of Greenwich fair, and of all the London fairs. The "fun of the fair" included jugglers, mountebanks, rope-dancers, acrobats, wrestling and other sports, wild beasts, learned animals, freaks and monstrosities, puppet-shows, miracle plays, mysteries, moralities, and stage plays of every description; ballad-singing, grinning through horse-collars, swings, roundabouts, and, in modern times, steam music. Ballad-singers were very popular at fairs; Outroaring Dick and Wat Wimbles, two Elizabethan trebles, were paid as much as 20 shillings a day at Braintree fair. Of fairings, or gifts bought at fairs, the most familiar are the little gingerbread figures, usually gilt, possibly a survival of images of saints.

The most celebrated London fair was Bartholomew fair (*q.v.*), and among existing English livestock fairs may be mentioned those for horses at Horncastle (described in George Borrow's *Romany Rye*), Barnet, and Woodbridge; Weyhill, for sheep, and Ipswich, for lambs; Exeter, for cattle and horses; and Carlisle and Ormskirk, for cattle. Nottingham has a goose fair; Falkirk, a fair, or tryst, for cattle, sheep, and horses; and Ballinasloe, co. Galway, one for cattle. Gloucester cheese fair is well known. In parts of England and Wales, and in Scotland, servants were engaged at the hiring, or statute fairs.

On the continent of Europe, the Lyons fair is supposed to have been founded by the Romans and long enjoyed a great reputation; bills of exchange from all parts of Europe were often made payable at Lyons fair. The fairs of Champagne and Briè were world renowned, and are referred to as early as the 5th century. Those of Frankfurt-on-Main and Frankfurt-on-Oder and those of Leipzig, especially the great Easter book-fair, were the best known German fairs. The most important Russian fair was the Makaryevskaya fair at Nijni-Novgorod (Gorki), July 29–Sept. 10. Held from remote times at various points on the Volga, it was settled at Nijni in 1817, taking its name from a monastery near Makaryev, where it was formerly held. The fair once comprised over 8,000 shops as well as circuses, theatres, banks. Trade was carried on in cotton, woollens, silk and linen goods, furs, iron, corn, salt, etc.

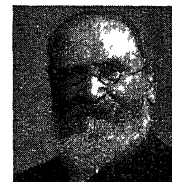
In the Nile delta Tanta is famous for its fairs, held thrice yearly at the tomb of Said el Bedawi, a 13th century saint. One of the largest fairs in Asia is that at Hardwar, or Hurdwar, in Upper India. The Meccan fairs existed long before the time of Mahomet. In the U.S.A. the term denotes an industrial exhibition. See *Exhibition*.

**Bibliography.** Fairs, Past and Present, C. Walford, 1883; *Memoirs of Bartholomew Fair*, H. Morley, 1859; *Treatise on the Law of Markets and Fairs*, J. G. Pease and H. Chitty, 1899; *The English Circus and Fair Ground*, G. Tyrwhitt-Drake, 1946.

**Fairbairn, Andrew Martin** (1838–1912). British theologian. Born near Edinburgh, Nov. 4,

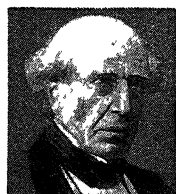
1838, and educated at the university there and at Berlin, for some years he was a Congregational minister at Bathgate and Aberdeen. He

became principal of the Airedale Congregational College, Bradford, in 1877, and in 1889–1909 was principal of Mansfield College, Oxford. He was Muir Lecturer at Edinburgh, Gifford Lecturer at Aberdeen, and Lyman Beecher Lecturer at Yale. He published numerous books chiefly on the philosophy of religion, among them *The Place of Christ in Modern Theology*, 1893, and *Philosophy of the Christian Religion*, 1902. He died Feb. 9, 1912.



Andrew M. Fairbairn,  
British theologian  
*Elliott & Fry*

**Fairbairn**, SIR WILLIAM (1789-1874). British engineer. Born at Kelso, Roxburghshire, Feb. 19,



Sir W. Fairbairn,  
British engineer

1789, the son of a farmer, in 1804 he was apprenticed to a millwright in Newcastle, and educated himself in his spare time. Coming to London in 1811, in 1817 he started in partnership with James Lillie an engineering business which proved successful. In 1830 he turned his attention to iron boat construction, and in 1835 opened shipbuilding works at Millwall. Moving thence to Manchester he invented a riveting machine, and superintended the construction of the Menai Bridge, 1848. He was made a baronet in 1869, and died Aug. 18, 1874.

**Fairbanks**. Town of Alaska. Situated on the river Tanana, it is the centre of government activities in the interior of Alaska, and is connected by the Alaska rly. with Seward (*q.v.*), 467 m. S. It is the N. terminus of the Alcan Highway (*q.v.*). Fairbanks became a U.S. air and army base during the Second Great War, and an experimental flying station was built on the outskirts. Pop. 3,455.

**Fairbanks**, DOUGLAS (1883-1939). American film actor. By name Douglas Ullman, he was born at Denver, May 23, 1883. Making his first appearance on the New York stage in 1901, he adopted the screen as his profession in 1914 and formed his own company in 1917. Athlete as much as actor, he endeared himself to audiences by the dash, verve, and charm with which he portrayed romantic historical and legendary heroes. His silent films included *The Three Musketeers*, *Robin Hood*, *The Thief of Bagdad*, *The Gaucho*, *The Iron Mask*; among his talking films were *The Taming of the Shrew*, *Around the World in 80 Minutes*, *The Private Life of Don Juan*. From 1920 to 1935 he was married to Mary Pickford (*q.v.*), and in 1936 to Lady Ashley. He died Dec. 12, 1939.

Douglas Fairbanks, junior (b. 1907), son of the above and his first wife, Beth Sully, was born Dec. 9, 1907, educated at Pasadena polytechnic school and Harvard military academy, and became a film actor. He first appeared in 1923, and in 1935 started his own company. The Amateur

Gentleman, *The Dawn Patrol*, *Catherine the Great*, *The Prisoner of Zenda*, *The Young in Heart*, were among his successes. Chairman of C.A.R.E., 1948, he was made an honorary K.B.E., 1949.

**Fairbridge**, KINGSLEY OGILVIE (1885-1924). South African founder of the movement for settling children from Great Britain on farm schools in the countries of the Commonwealth. Born at Grahamstown, Cape Province, May 2, 1885, he was a Rhodes scholar at Exeter College, Oxford, and formed, with 49 fellow undergraduates, the Child Emigration Society in 1909. He gained a diploma in forestry, sailed for Western Australia in 1912, and started with his wife the first Fairbridge farm school at Pinjarra with 35 boys. By 1934 the prince of Wales was appealing for £100,000 for more schools on the same model; the result was the founding of the Prince of Wales Fairbridge farm school on Vancouver Island, near Duncan; a fruit farm at Fintry, in the Okanagan Valley, B.C.; and another school at Molong, N.S.W. There is also a memorial college near Bulawayo, S. Rhodesia. Fairbridge, who was the author of *Veldt Verse* and other poems, and an autobiography, died July 19, 1924, at Perth, W. Australia.

**Fairey**, SIR (CHARLES) RICHARD (b. 1887). A British aeronautical engineer. He was born May 5, 1887, and educated at Merchant Taylors' and Finsbury technical college. He was manager of the Blair-Atholl Aeroplane Syndicate, 1911-13, and in 1915 founded the Fairey Aviation Co., Ltd., which produced in the Second Great War such famous types as the *Battle* (*q.v.*), *Swordfish* (*q.v.*), *Albacore*, *Barracuda* (*q.v.*), *Fulmar* (*q.v.*), and *Firefly* (*q.v.*). Fairey was president of the Royal Aeronautical Society, 1930-31 and 1932-33, being awarded its Wakefield gold medal for the invention of wing flaps. In 1942-45 he was director-general of the British air commission at Washington, receiving a knighthood. Fairey was also a yachtsman.

**Fairfax**, FERDINANDO FAIRFAX, 2ND BARON (1584-1648). English soldier. The son of a Yorkshire landowner, he was born March 29, 1584, and when young served against Spain in the Netherlands. In 1640 he succeeded his father as Baron Fairfax of Cameron, a Scottish title dating from 1627, but this did not prevent him from becoming a member of the Long Parliament. Therein, taking the

side of the parliament, he was chosen to command its forces in Yorkshire when war began in 1642. He served for about two years, but met with only one or two minor successes; he was routed at Adwalton Moor, and driven from the field at Marston Moor. He died March 14, 1648.

**Fairfax**, THOMAS FAIRFAX, 3RD BARON (1612-71). English soldier. The son of the 2nd baron (*v.s.*), he was born at Denton, Yorks, Jan. 17, 1612. He went to S. John's College, Cambridge, after which he saw military service in the Netherlands. In 1640 he fought against the Scots, but when the civil war began in 1642 he and his father were prominent among the king's opponents. Thomas was present at Marston Moor in 1644. On the passing of the self-denying ordinance, he was made commander-in-chief of the parliamentary armies, and as such gained the victory at Naseby. At the end of the first period of the war he was something of a national hero.

He had little sympathy with the policy of the more violent of the army leaders. He helped to put down the royalist rising in 1648, and was one of the judges appointed to try Charles I; but when the trial began he refused to sit, and in 1650 he refused to march against the Scots and resigned his position as head of the army, receiving a pension of £5,000 a year. In 1659-60 he helped Monk to place Charles II on the throne, going as head of the deputation to The Hague. He was elected as M.P. for Yorkshire to the new parliament, and that was the end of his public career, although he lived until Nov. 12, 1671. Fairfax was a man of culture who wrote two accounts of his campaigns, verses, and made translations. His correspondence was published in four volumes, 1848-49. The Great Lord Fairfax, by Sir C. R. Markham, appeared in 1870.

Thomas Fairfax, who became the 6th baron, sold Denton Hall, the Yorkshire seat of the family, and settled in Virginia, where he lived in princely splendour. His brother, the 7th baron, died without sons, and the title passed to



From an engraving



a distant relative. For a time, the heirs being American citizens, it was not claimed, but in 1912 Albert Kirby Fairfax (1870-1939) was permitted by the house of lords to call himself 12th baron. Dying Oct. 4, 1939, he was succeeded by his son Thomas (b. 1923).

**Fairfax, SIR JAMES READING** (1834-1919). An Australian newspaper proprietor. Born at Leamington, England, Oct. 17, 1834, he joined the staff of his father's paper, the Sydney Morning Herald, in 1851. Five years later he became a partner, and during the remainder of his life was actively engaged in the management of the Sydney Mail, which he founded. Knighted in 1898, he was president of the national art gallery of N.S.W. He died March 28, 1919.

**Fairfield.** Mountain in Westmorland, England. Its peak reaching 2,863 ft., it lies S. of Helvellyn and can be ascended from Grasmere. Fairfield is also the name of suburbs of Liverpool, Manchester, and Buxton.

**Fairford.** Parish and village of Gloucestershire, England. It stands on the Coln, 25 m. W. of Oxford, with a station on a branch rly. Its 15th century church, dedicated to S. Mary, and built by John Tame, a London merchant, contains some of the most wonderful stained glass in the country. The 28 windows figure the whole story of the Creation and of the work of Jesus Christ. The village has a fair, was formerly a centre of cloth manufacture, and is visited for trout fishing. It was the birthplace of John Keble. In the neighbourhood are Hathrop Castle and Fairford Park. Pop. 1,365.

**Fair Head** OR **BENMORE.** Headland on the N. coast of Antrim, N. Ireland. It is 4½ m. N.E. of Ballycastle, is 636 ft. high, and being a sheer precipice from a height of 320 ft. presents a superb basaltic columnar formation.

**Fairing.** A cover or casing placed over certain parts of an aeroplane, motor vehicle, or railway train so that the aircraft or vehicle offers the minimum resistance to the air when travelling at speed. Fairing is a fundamental part of streamlining; in streamlined motor vehicles such protuberances as door handles, headlamps, etc., are faired into the body and wings. On streamlined trains the smoke-stack is faired into the boiler covering and the coachwork of the carriages is clean-swept from the roof to within a few inches of the rails. On air-

craft protuberances are reduced to a minimum by fairing them into the fuselage and wings.

**Fair Isle** OR **SHEEP ISLE.** One of the Shetland Is., about equidistant from Mainland in that group



Fair Isle, Shetland Islands, from the east, with the lighthouse on the southern extremity  
Valentine

and the Orkney Is. It is 3 m. long and 2 m. broad, and rises to 480 ft. in Sheep Craig on the E. coast. Fishing and sheep-rearing are engaged in, and the island gives its name to a characteristic style of knitting popular for pullovers and jumpers. This may have been learnt from Spaniards of the Armada who were wrecked here. The island has two lighthouses, and is in telegraphic communication with the mainland. Long a bird sanctuary, Fair Isle in 1948 became the property of an Edinburgh ornithologist. Pop. 100.

**Fairlie.** Parish, village, and watering-place of Ayrshire, Scotland. It stands on the Firth of Clyde, 2 m. S. of Largs by rly. It has a yacht-building yard, and castle ruins. Pop. 1,288.

**Fair Maid of Perth, THE,** OR **ST. VALENTINE'S DAY.** Romance of Scotland in the last years of the 14th century. Published in May, 1828, it forms the second series of Scott's Chronicles of the Canonicate. The titular heroine is Catharine, the beautiful and devout daughter of Simon Glover, Burgess of Perth. In addition to the unique study of the Highland lad Conachar (Eachin Mac-Ian), nominally Simon's apprentice, who is destined to be the last chief of the Clan Quhele, and whose inherent cowardice offers a striking contrast to the dauntless courage of Henry Smith (Hal of the Wynd), the armourer who is also Catharine's suitor, the story contains a vivid description of the Palm Sunday battle on the North Inch between the champions of the rival clans Chattan and Quhele.

**Fair Oaks, BATTLE OF.** Federal victory in the American Civil War, May 31-June 1, 1862, also known

as the battle of Seven Pines. In command of the Federals, McClellan was forcing Johnston back upon Richmond when the Southern general made a stand as the Federals were crossing the Chickahominy river. Two of McClellan's corps were already to the S. of the river when they were attacked by Longstreet. Reinforcements were hurried up, and stubborn fighting took place, during which Johnston was severely wounded, being succeeded by G.W. Smith. The next day, June 1, Longstreet's attack was repulsed, and Lee arrived in time only to withdraw the Confederate army to Richmond. About 42,000 men were engaged on either side. The Federal losses were 5,000, the Confederates losing more than 6,000.

**Fair Trade.** Term much used in the United Kingdom during the latter part of the 19th century for what was later called tariff reform. It was used by the opponents of free trade, who demanded that the United Kingdom should admit the goods of other nations only on the same terms as British goods were admitted by them. After languishing for a time the cause revived early in the 20th century in the shape of Tariff Reform. See Free Trade; Tariff Reform.

**Fair Wages Clause.** Clause which, in accordance with a resolution of the British parliament, must be included in all government contracts and which requires contractors to pay wages and observe hours and conditions of labour not less favourable than those established in the district by negotiation or arbitration between employers' organizations and trade unions. Workers must be free to join a trade union. The contractor must see that his sub-contractors observe the clause. It is included in contracts made by local authorities, in other contracts involving expenditure of public money, and in industries regulated by Act of parliament, such as the sugar and film industries, road and air traffic, navigation.

The first resolution requiring a fair wages clause was introduced in the house of commons by Sidney Buxton in 1891. The form was amended in 1909 and 1946. The clause was necessary because some

employers in their anxiety to obtain government contracts put in very low tenders which could be made profitable only if they cut their rates of wages. Without it public contracts would tend to go to the worst employers.

**Fairway.** Navigable part of a river or other channel. It is continually under supervision to keep it free from obstructions. The term is used in golf for the direct path of short grass between tee and green.

**Fair Wear and Tear.** Term used in contracts. It is frequently provided in tenancy agreements or in agreements for the hire of chattels that the tenant or hirer shall be bound to keep the house or chattel in good repair, "fair wear and tear excepted." The phrase has been used in legal documents for centuries. Its effect is to negative any liability for (1) damage due to the normal or ordinary operation of natural causes such as wind and weather as distinct from damage due to abnormal natural events such as lightning, hurricane, flood, or earthquake; (2) damage caused by the tenant either unintentionally or as a normal incident of a tenant's occupation or use.

**Fairweather.** A mountain of Alaska, U.S.A. It is a volcano in the St. Elias Range, alt. 15,300 ft.

**Fairy.** Legendary or mythical being common to the folklore of most peoples. Fairies are manifested in varied forms, from tiny creatures in human shape which haunt the flowers, to the ordinary size of human beings. They are, however, generally regarded as relatively small, whence it has been surmised that the origin of the fairy myth is to be found in a dim antiquity when surviving races were in conflict with smaller races that have become extinct. The discovery of the African pygmies has lent colour to this; Sir Harry Johnston pointing out that the actions of those dwarf people again and again suggested the traits attributed to the brownies and goblins of fairy lore. Fairies in their many manifestations are sometimes friendly and beneficent, sometimes mischievous and malevolent.

The term is occasionally employed as covering the whole field of terrestrial supernatural beings; hence Fairyland is a sort of fourth dimensional world that coexists with that in which we live, and the term fairy stories is applied to all tales introducing earthly beings of an extra-natural character. In poetry and modern fairy stories the fairy is generally represented

as a tiny dainty creature. Since fairy originally meant enchantment, and then fairy people collectively, a single fairy is better called fay, Fr. *fée*, Ital. *fata*, from late Lat. *fata*, a fate or fay, the neut. pl. of *fatum* being used as a singular. See Brownie; Changeling; Elf; Folklore; Gnome; Goblin; Puck; Sylph.

**Bibliography.** Teutonic Mythology, Jakob Grimm, 1835 (Eng. trans. J. S. Stallybrass, 1880-88); Fairy Mythology, T. Keightley, 1847; Science of Fairy Tales, E. S. Hartland, 1889; British Fairy Origins, L. Spence, 1946.

**Fairy Ring.** Ring of a more vivid green than the surrounding grass of fields, fancifully ascribed to fairies dancing in a circle at night. It is actually caused by the growth of certain species of fungi—notably the fairy-ring champignon (*Marasmius oreades*)—which, starting from the centre, extend their underground threads (*mycelium*) in all directions, forming a circle increasing every year.

**Fairy Shrimp** (*Chirocephalus diaphenus*). Species of fresh water crustacean belonging to, the subclass Entomostraca. Within this sub-class is the primitive order Branchiopoda, containing two sub-orders Cladocera and Phyllopoda. The fairy shrimp is a phyllopod; a beautiful creature, semi-transparent, it is not widely found but is reasonably plentiful in certain parts of England.

**Faisans, ÎLE DES** (Fr., Pheasants' Isle). Island in the river Bidassoa, lying between France and Spain, about 15 m. S.E. of San Sebastian. Its position between two frontiers made it on two notable occasions the meeting-place of French and Spanish negotiators. Louis XI and Henry IV of Castile met here in 1463, and Mazarin and Don Luis de Haro here concluded the treaty of the Pyrenees in Nov., 1659, by which Spain ceded Artois and other northern possessions, and gave up her claims to Alsace and Lorraine, while France gave up territory taken in Italy and N.E. Spain.

**Faith** (Lat. *fides*). In ordinary speech a term used to denote the leap of the mind from the known to the unknown. In the sphere of nature it signifies the acceptance of fundamental assumptions which in themselves are incapable of logical demonstration. The law of the Uniformity of Nature, for instance, is an act of scientific faith enunciating a universal principle on the basis of certain established data. The fact that the sun has invariably risen at daybreak does

not in itself afford a demonstrative proof that it will always rise, but justifies our faith that it will. In the sphere of human relations the term is also employed to denote the confidence which we feel in other men whose character and integrity are known to us.

From ordinary usage the term naturally passed into the religious sphere—to which it pre-eminently belongs—and is commonly used to describe the faculty or organ of the soul by which a man grasps the realities of the unseen and divine universe. What the eye is to the body, faith is to the soul. It is the medium or instrument by means of which the soul enters into communion with God.

Philosophers and theologians have made many attempts at a psychological analysis of the faculty of faith. Some have held that it is a divine endowment—a special religious sense, created in the soul for the purpose of the exercise of spiritual functions. Others have regarded it as an aspect of the emotions analogous to the aesthetic sense. A third school has made it a department of the intellectual side of human nature; while a fourth has located it in the activity of the will. All these theories are inadequate, for intellect, feeling, and will are all involved in the act of faith, which has been defined as "a resolution to stand or fall by the noblest hypothesis."

Corresponding to these different views as to the character of the organ of faith, there are similar divergences of opinion as to the scope of its activity. Even in the N.T. the term is used in three different senses. In the Epistle of James it is employed to signify the intellectual assent of the mind to the primary Christian beliefs, and from this use of the word has grown up the conception which identifies faith with the acceptance of a creed. In the Epistle to the Hebrews, on the other hand, faith is defined as "the assurance of things hoped for, the proving of things not seen," words which Dr. Moffatt has paraphrased, "Faith means we are confident of what we hope for, convinced of what we do not see." It is out of this interpretation of faith that Christian mysticism developed. To the Apostle Paul faith has still a deeper significance. It implies nothing less than the complete surrender of the soul to Christ as its Redeemer and its Lord. - And it is to this great idea of faith that the Evangelical interpretation of Christianity owes its genesis and inspiration.

**Faithful.** Character in Bunyan's *Pilgrim's Progress*. He meets Christian during his journey to the Celestial City and the two travel together to Vanity Fair, where Faithful is put on trial, condemned to death, and burnt, but is taken up to the City in a chariot.

**Faithfull, EMILY** (1835-95). A British publicist. Born at Headley rectory, Surrey, and educated at



Emily Faithfull,  
British publicist  
Downey

Kensington, she devoted the greater part of her life to advocating the claims of women to remunerative employment. In 1860, in Great Coram Street, London,

she founded a printing office in which women were employed as compositors, and for which she secured the approval of Queen Victoria. Later, in Farringdon Street, she formed the Victoria Press, and was appointed printer and publisher in ordinary to the queen. In 1863 she started a monthly entitled *The Victoria Magazine*. In 1868 she issued a novel, *Change upon Change*. Her lectures in the U.S.A., 1872-73, were described in her *Three Visits to America*, 1884. She received a civil list pension of £50 in 1889 and died May 31, 1895.

**Faith Healing.** Cure of disease by faith in the healing power of God. In the early Church the practice of anointing the sick for the purpose of curing them was a normal function of the clergy, and still survives in an altered form and with different intention in Extreme Unction. In medieval days the touch of a saint or of his relics was resorted to for healing; and down to the time of Queen Anne the British sovereign used to touch persons to cure them of scrofula.

The practice of faith healing is common among certain Protestant bodies, such as the Peculiar People and Four-square Gossellers. Most of the miracles at Lourdes and elsewhere are probably examples of faith healing. Such cures are usually effected in functional and nervous complaints, not in cases of organic lesion; and medical science attributes them to the power of suggestion upon the minds of persons who are at the time in a state of strong religious emotion. See *Christian Science*.

**Faithorne, WILLIAM** (1616-91). English engraver. Born in London, he studied painting and draw-

ing under Robert Peake, and engraving with John Payne. Made prisoner by the Roundheads in the Civil War, he pursued his art in Aldersgate prison, and on his liberation proceeded to Paris, becoming a pupil of Robert Nanteuil. Returning to London in 1650, he set up as a print-seller near Temple Bar, retiring 1680. He was buried at Blackfriars, London, May 13, 1691. Faithorne engraved portraits of most of the conspicuous figures of the Commonwealth and Restoration after Van Dyck, Lely, Dobson, and others, among them the notorious Lady Castlemaine. His portraits of Charles I, Charles II, James II, the duke of Monmouth, Milton, Killigrew, and Hobbes may be mentioned.

**Faiyum.** Another spelling of the name of the province in Upper Egypt described as Fayum.

**Faizabad** or **FYZABAD.** Division, district, and town of Oudh, United Provinces, India. Faizabad city, the administrative headquarters (with cantonment) of the district, is situated at the junction of three branches of the Oudh and Rohilkhand rly., and forms with Ajodhya a single municipality. Its chief industry is sugar refining, and it has a large agricultural trade. It is the terminus of the river steamers on the Gogra. The main crops of the district are rice, grain, wheat, lentils, peas, barley, and sugar-cane. Pop., div., 7,583,538, 75 p.c. Hindus; dist., 1,319,425, 90 p.c. Hindus; town, 57,632, 70 p.c. Hindus.

**Fakenham.** Parish and market town of Norfolk, England. It stands on the Wensum, 24 m. by rly. E.N.E. of King's Lynn. It has

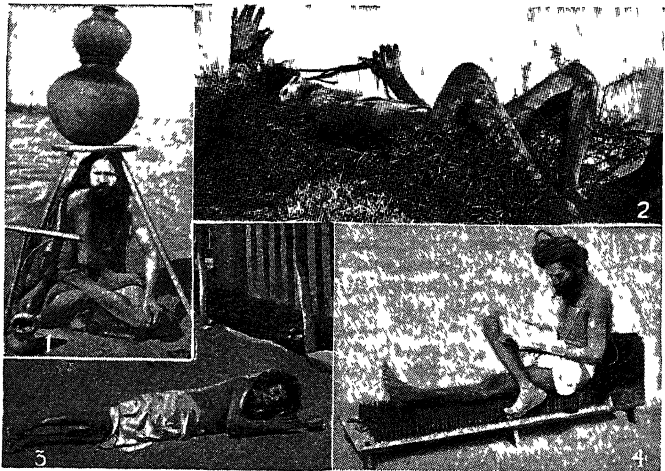
two railway stations, one mile distant from each other. The chief building is the church with a lofty tower. Pop. 2,843.

**Fakir** (Arab. *fakir*, beggar). Religious devotee, especially in India. Fakirs number perhaps a million, the majority of them being Mahomedans, while others are Hindus, Sikhs, or Jains. The Mahomedans are orthodox members of the marrying dervish orders or unorthodox celibate mendicants who dispense with abstinence, fasting, and prayer. The Hindus include members of the monastic yogi orders devoted to education and poor relief, besides mendicant vagabonds who practise jugglery and resort to mutilations and austerities. See illus. below.

**Fal.** River of Cornwall, England. It rises near Roche, flows S. and S.W. 23 m. to the English Channel at Falmouth, and is navigable for nearly 10 m.

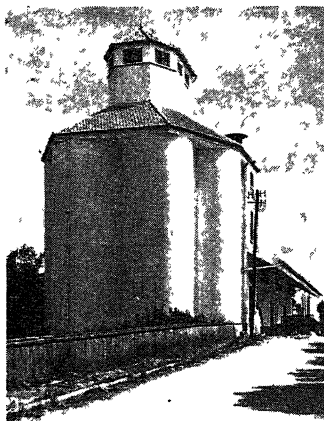
**Falaba.** British liner torpedoed by the German submarine U28 S. of St. George's Channel, March 28, 1915. She sank in a few minutes with the loss of 100 lives. At the inquiry it was stated that the submarine was flying British colours and its crew wore khaki. The Germans attempted to justify this attack by saying that it was a return for Great Britain's attempt to starve out Germany. The Falaba, 4,800 tons, belonged to the Elder Dempster Co.

**Falaba.** Town of Sierra Leone, W. Africa. It is fortified, and lies near the frontier of French Guinea, 170 m. N.E. of Freetown, at the junction of many trade routes. There is trade in palm kernels and kola nuts.



Fakir. 1. Undergoing thirst ordeal; with the river by his side and jars of water overhead, he abstains from drinking. 2. Lying on a bed of thorns. 3. Rolling his way from shrine to shrine. 4. Seated on a bed of nails.

**Falaise.** Town of France, in the dept. of Calvados. It stands on the Ante, 20 m. S.S.E. of Caen. It is an agricultural centre, and Guibray, a suburb, is noted for its horse and cattle fairs. Other industries are tanning and the manufacture of hosiery, cottons, and dyestuffs. The chief churches were S. Gervais, with its fine Norman tower and some beautiful stonework, and the Trinity; the former was destroyed and the latter badly damaged in the Second Great War. The most interesting building is the ruined castle, famous as the birth-place of William the Conqueror and at one time the residence of the dukes of



Falaise. The castle where William the Conqueror was born. Top. Post war rebuilding in the devastated town; granary, completed 1947  
Top photo, The Times

Normandy. It is on a hill above the town. Near the town hall is an equestrian statue of William the Conqueror by Louis Rochet was erected in 1851. As part of Normandy, Falaise was long a possession of the English kings. In 1450 it was finally captured by the French.

**BATTLE OF THE FALAISE GAP.** In mid-Aug., 1944, the Allied armies in Normandy were fighting to encircle the main body of the German 7th army by closing the Falaise-Argentan gap. British and Canadians were pressing S. towards Falaise and U.S. and French armoured units advancing N. to Argentan. By Aug. 15 the gap was only 10 m. wide and about half the German army had withdrawn. Falaise was captured by Canadians on Aug. 17, having been reduced to ruins, and U.S. troops were fighting in Argentan. Two days later the gap was closed by the Allied meeting at Chambois, and by Aug. 22 the pocket was eliminated. About 100,000 Germans were accounted for, either as casualties or as prisoners, in these operations.

during the civil war of 1936-39. At first the organization showed tendencies towards radicalism, but the Conservative military caste in the movement seized control, Franco became the head, and on April 19, 1937, the Falangists, Carlists, and other political groups in the nationalist movement were united under the title Falange Española Tradicionalista. The army was incorporated into the Falange and the influence of its national council considerably increased thereby.

As reconstituted by Franco, the Falange consisted of thirteen elements: the caudillo, or leader; the national council; the political junta; its president; the secretary general; the national delegates; the national inspectorates; the militia and syndicates; the internal services,

the regional inspectorates; the provincial groups; the local groups; and individual members. Personnel of the army, navy, and air force became individual members. The Falange was the sole political party permitted in Spain and was ruled by a national council of 100 under the presidency of Franco. In July, 1942, the Spanish cortes was re-established on Falangist lines. The Falangist militia, dissolved on Dec. 20, 1943, was incorporated into the army.

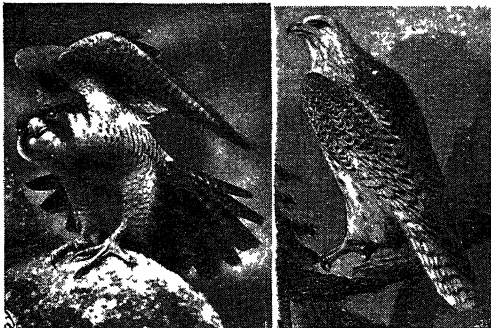
A Falangist party established in Mexico, 1937, was abolished by the government on April 5, 1939.

**Falashas** (Ethiop., strangers). Communities of Hamitic stock, mainly between Axum and Gondar, in Abyssinia. Although allied racially to the Galla, and ignorant of Hebrew and the Talmuds, they profess Judaism, there being three distinct sects. They are farmers and artisans, speaking an Abyssinian (Agao) dialect, and they practise a rigid racial and ritual exclusiveness with which various pagan observances are mingled.

**Falces.** Town of Spain, in the prov. of Navarre. It stands in a plain between the rivers Ebro and Arga, 30 m. S.W. of Pamplona. It has ruins of a Roman castle, but is chiefly known for the mineral springs in the vicinity.

**Falchion.** Type of sword used in medieval times. Usually slightly curved and rather heavy, the blade was broader towards the point than at the hilt. The word comes from Lat. *falx*, sickle. See *Sword*.

**Falcon** (Lat. *falco*). Name applied generally to the family of birds of prey Falconidae, which includes falcons, hawks, kites, and eagles; but more especially to the genus *Falco*, which includes the true falcons, the peregrine falcon, and the kestrels. All these have short, curved beaks with one notch in the upper mandible, round



Falcon. Two species found in the British Isles: left, the peregrine falcon; right, Scandinavian jer-falcon

nostrils, short pointed wings, and long toes.

Several species of falcon are found in Great Britain. Of these the peregrine falcon builds sparsely on cliffs in the S. of England. It preys mainly on birds, and its ravages among game are compensated by the fact that it attacks only the weaklings, and thus tends to maintain the strength of the breed. It was formerly trained to bring down birds in hawking.

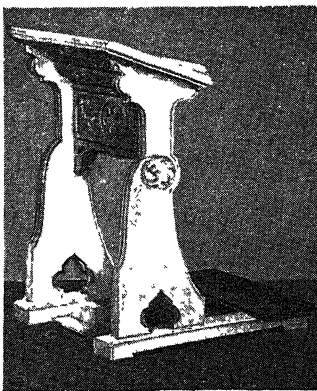
Other species which occur in the British Isles are the Greenland falcon, the Iceland jer-falcon, and the Scandinavian jer-falcon, all of which are occasional winter visitors. The birds take their name from the hook-shaped claws (Lat. *falx*, sickle). See *Hawking*.

**Falcon.** Volcanic island of the Tonga or Friendly Islands. It is in lat. 20° 20' S. and long. 175° 20' W. It made its appearance above the ocean on Oct. 14, 1885, after a volcanic eruption. It disappeared for a time, but was again uplifted.

**Falcón.** Maritime state of N. Venezuela, facing the Gulf of Maracaibo and Caribbean Sea and bounded S. by the state of Lara. It has been a separate state since 1904, when it was separated from Zulia. The coastal region is low-lying and sterile, but inland there are several ranges of hills with fertile valleys. Agriculture and stock-raising are the chief industries; coffee, cocoa, sugar, cotton, tobacco, and maize are produced. Coal is worked in small quantities, but the mineral resources of the state are virtually untapped. The capital is Coro. Pop. 232,644.

**Falcone, ANIELLO** (1600-65). Italian painter. Born in Naples, he was a pupil of Ribera, and became famous as a spirited painter of battle scenes. During the insurrection of Masaniello, 1647, Falcone gathered a band of his friends and pupils, among whom was Salvatore Rosa (*q.v.*), and this "Company of Death" made many Spaniards pay with their lives for the murder of the leader's nephew and of one of his pupils. Pictures painted of these events are in the museum at Naples. Falcone worked in Paris from 1648 to 1656, when he returned to Naples, where he died. His *Fight between Turks and Cavalry* is in the Louvre.

**Falconer, HUGH** (1808-65). Scottish botanist. Born at Forbes, Feb. 29, 1808, Falconer was educated at Aberdeen and Edinburgh universities, and entered the service of the East India Company as a surgeon in 1830. His chief interests, how-



Faldstool or portable Litany desk of carved oak

ever, were in palaeontology and botany: he discovered remains of mastodon and other fossils, experimented in tea-planting in India, introduced cinchona bark as a remedy for malaria, and discovered the *asafoetida* plant, used in medicine. Returning to England, he arranged the Indian fossils at the British Museum, 1844-47, and then returned to India as professor of botany and curator of the botanical gardens of Calcutta, where he worked until 1855. He died in London, Jan. 31, 1865.

**Falconer, SIR ROBERT ALEXANDER** (1867-1943). A Canadian scholar. Born Feb. 10, 1867, at Charlottetown, Prince Edward Island, he was the son of a Presbyterian minister. His education, begun in Trinidad, was continued at Edinburgh and German universities, after which, in 1892, he returned to Canada and was ordained in the Presbyterian ministry. In 1904 he was made principal of Pine Hill College, Halifax, and was president of Toronto university, 1907-32. He wrote *Citizenship in an Enlarging World*, 1928; *Immortality and Western Civilization*, 1930. Knighted 1917, he died Nov. 6, 1943.

**Falconer, WILLIAM** (1732-69). Scottish poet. Born at Edinburgh, Feb. 11, 1732, the son of a barber, he became a sailor, and wrote *The Shipwreck*, 1763, a realistic poem, and a *Marine Dictionary*, 1769. He joined the navy, and in Sept., 1769, sailed for India in the frigate *Aurora*, which was lost off Cape Town, with all hands.

**Falconry.** The sport of hawking and the breeding and training of hawks, more usually known as hawking (*q.v.*).

**Faldstool** (late Lat. *faldistorium*; Ger. *fallen*, to fold, *Stuhl*, stool, seat, or throne). Portable

crossed or folding stool so constructed that it can be used as a *prie-dieu* or kneeling desk or a seat. In England it was used by bishops when occupying a seat in the sanctuary other than their throne, or when visiting a church other than their cathedral; and it is still used in Roman Catholic churches. The term is applied to the small, low desk at which the Litany is enjoined to be sung or said, and to the stool at which a sovereign kneels at his coronation. The *faldistorium* on which Queen Mary sat at her marriage with Philip II of Spain is preserved in Langton's chapel, Winchester Cathedral.

**Falemé.** River of Senegal. It forms part of the boundary between the Senegal and French Sudan colonies. It rises in French Guinea in the watershed separating the Gambia and Bafing rivers, and runs N.N.W. to the Senegal river, which it enters near Bakel. It is navigable over part of its course for small boats during the wet season. Its length is 200 m.

**Falerii.** Ruined city of Etruria. Its site is near the modern town of Cività Castellana, 35 m. N. of Rome. One of the league of 12 Etruscan cities, its origin is lost in antiquity, but it was destroyed by the Romans, 241 B.C. The inhabitants built a new town 3 m. N.W. of the original site. Of the Roman *Falerium Novum* there are many remains, the walls, towers, and gateways being well preserved, and reputed to be among the most remarkable specimens extant of ancient military architecture. The town was deserted early in the 11th century.

**Falernian Wine.** Famous wine of the ancient Romans. It was light in colour and potent. A wine produced in the district, which is a fertile plain in Campania, near the Volturno river, is called Falerno.

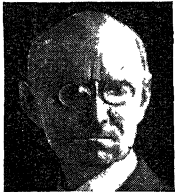
**Falguière, JEAN ALEXANDRE JOSEPH** (1831-1900). A French sculptor and painter. Born at Toulouse, Sept. 7, 1831, he studied at the Beaux Arts under Joffrey, and at Rome. His work was at first classical in manner, but afterwards became strongly realistic. A marble statue of Tarcisus, boy martyr, now in the Luxembourg, was his crowning success; one may cite also the statue of Lafayette in Washington, a monument to Joan of Arc, a quadriga on the Arc de Triomphe, Paris, and a painting *The Wrestlers*. Falguière died April 19, 1900.

**Faliero, MARINO** (1279-1355). Doge of Venice. He defeated the Hungarians at Zara in 1346, and

captured the city. Elected doge in 1354, his troubles began with the defeat of the Venetian navy by the Genoese. The unrest caused by this disaster aroused Faliero's ambitions. He allied himself with the leaders of the populace, and a plot was hatched to murder the leaders of the nobility on April 15, 1355, and proclaim Marino prince of Venice. The Council of Ten, learning of the plot, seized Faliero, who confessed his share therein and was executed April 17.

**Falkenhausen**, FRIEDRICH, BARON VON (1869-1936). German soldier. He was born at Potsdam, and entering the army in 1887 had a distinguished career. He commanded the 6th army corps, 1916-17, and in April, 1917, succeeded von Bissing as governor-general of Belgium, where his rule was more oppressive than that of his predecessor. In the course of one year he had 170 Belgians shot, and he authorised severe penalties, deportations, and floggings. He died May 4, 1936.

During the Second Great War another von Falkenhausen, Alexander Ernst



A. von Falkenhausen, German soldier

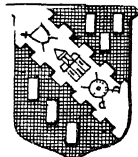
(b. 1878), nephew of Ludwig, came into prominence as military governor in Belgium and N. France, 1940-44. He had been a staff officer with the Turkish army in Palestine during the First Great War, and later was commander of the infantry school at Dresden, retiring 1930 as lieutenant. Anti-Nazi in his convictions, he served as head of a German military mission to Chiang Kai-shek, 1934-38, remaining as his adviser until recalled by Hitler to active service. Consistent opposition to the S.S. led to his dismissal and internment in a concentration camp shortly before the "July plot" of 1944. Released by British forces at the end of the war, he was held as a witness by U.S. authorities until 1947.

**Falkenhayn**, ERICH VON (1861-1922). German soldier. He was born at Burg Belchau, Sept. 11, 1861, and entered the army in 1880. After leaving the academy of war in Berlin in 1890 he joined the general staff. In 1913 he was appointed minister of war, which post he held at the outbreak of the First Great War; but in Dec., 1914, he was appointed chief of the

general staff, and was its responsible head till removed in Aug., 1916, owing to the failure of the German offensive at Verdun. Next month he was commander-in-chief of the 9th army, and launched the Rumanian campaign. He later went to the Middle East to direct the Turkish operations against the British in Palestine and Mesopotamia, but not being successful was recalled and replaced by Liman von Sanders in March, 1918. By many, Falkenhayn was regarded as the ablest strategist produced by Germany during the First Great War. He died April 8, 1922.

**Falkenhorst**, NIKOLAUS VON (b. 1885). German soldier. He commanded an army corps in the German invasion of Poland in 1939, and in 1940 was appointed commander-in-chief of the German occupation forces in Norway. In 1941 he was given command of the German armies in the N. sector of the Russian front, but after reverses in 1942 was relieved of his command. Sentenced to death by a British war crimes court at Brunswick, Aug. 2, 1946, for having ordered commandos to be shot, he was reprieved and imprisoned for life.

**Falkirk**. Parl. and mun. burgh and market town of Stirlingshire, Scotland. It is 22 m. N.E. of Glasgow, and is served



Falkirk arms

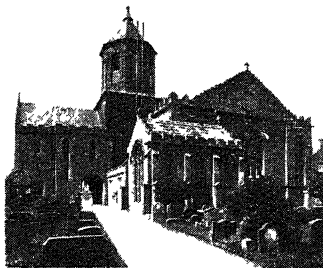
by two rly. lines. Falkirk, the boundary of which embraces the suburbs of Laurieston, Grahamston, Bainsford, and Camelon, is connected by rly. with Grangemouth (3 m. N.E.). its port on the Firth of Forth, and is the centre of a busy ironworking and colliery district. The great Carron ordnance works was founded in 1760. Today the main manufactures are light castings, pipes, ranges, and stoves. Brewing, dis-

tilling, tanning, and the manufacture of bricks, tiles, chemicals, and enamelled goods are flourishing industries. The famous cattle "trysts" or open sales, which were held thrice yearly, have been superseded by weekly markets (Tues.). At Westerglen is the B.B.C. Scottish regional transmitter. Falkirk became a burgh in 1600. Its first church was built by Malcolm III (Canmore). With Grangemouth and Stirling it returns one M.P. Pop. est. 38,400.

**Falkirk**, BATTLES OF. The first battle of Falkirk was fought, July 22, 1298, between the English and the Scots. Under Edward I the English invaded Scotland to crush the rebellion of William Wallace. The two armies met near Falkirk. The Scots, mostly pikemen, were ranged in four circular groups, each ring surrounded by stakes. Between the groups were bowmen and behind a few horsemen. The English knights were in three columns, their traditional formation, flanked and backed by archers. The first line charged, only to founder in a morass in front of the Scots; the second drove away the bowmen, but made no impression upon the pikes. Edward, therefore, called upon his archers, whose deadly aim soon broke the Scottish rings. The knights seized their advantage, and soon the Scots, greatly outnumbered, were either dead or in flight.

The second battle was fought between the English, under General Hawley, and the Jacobites, Jan. 17, 1746. Charles Edward, the Young Pretender, returning from Derby, found his way N. barred by the English. His Highlanders, in an impetuous charge, swept away the English troops, and Hawley lost 700 prisoners.

**Falkland**. Royal and mun. burgh of Fife, Scotland. It stands at the N. foot of East Lomond Hill, 36 miles by railway N. of Edinburgh. The chief attraction is its palace, formerly the residence of the dukes of Fife, in which David, the duke of Rothesay, heir to the Scottish throne, is said to have been starved to death at the instance of Albany, the regent, in 1402. The palace was a favourite residence of the Scottish monarchs; here James V sought refuge and died in 1542, and here Elizabeth (q.v.), daughter of James I, was born in 1596. Richard Cameron, founder of the Cameronians, was also a native. Rob Roy occupied the palace in 1715. It fell into decay, but was restored towards the end of the 19th century by the



Falkirk. Parish church which in 1811 replaced the "Speckled Kirk" built 1057-93



3rd marquess of Bute. Brewing and weaving are carried on in the town. Pop. 2,181.

**Falkland, LUCIUS CARY, 2ND VISCOUNT** (c. 1609-43). English royalist. He was the son of Sir



Lucius Cary, 2nd Viscount Falkland  
After Van Dyck

Henry Cary, a Devon man, who, after being lord deputy of Ireland, was made a Scottish peer as Lord Falkland in 1620. Lucius was educated at Trinity College, Dublin, and saw a little military service in the Netherlands. In 1633 he became Viscount Falkland, but by this time he had inherited from his grandfather, Sir Lawrence Tanfield, the estate of Great Tew, Oxon. His political career began in 1640 with his election as M.P. for Newport. He opposed the worse illegalities of the king, but was never a bitter partisan, and gradually, as the opposition to Charles hardened, he became more definitely on his side. In 1642 he was made a secretary of state. He was at Edgehill with Charles, but soon he fell into the melancholy described by Clarendon, seeing nothing but misery before his country. Expressing a wish to be "out of it ere night," he found the death he desired at Newbury, Sept. 20, 1643, when riding forward alone towards the foe.

Falkland is known mainly from the accounts given of him by his friend Clarendon, and these make him one of the most attractive men of his own or any age. He loved learning, and the society of scholars, who gathered in delightful freedom at his house; Chillingworth, Hales, Suckling, and Waller were among them. He wrote *A Discourse of Infallibility*. Of him Clarendon said, "Whosoever leads such a life need not care upon how short warning it be taken from him." The title passed to Falk-

land's eldest son, but his direct line died out in 1694. It then passed to Lucius (d. 1730), a descendant of the 1st viscount, the ancestor of the 13th viscount (Lucius Cary, b. 1880,) who succeeded 1922. *Consult* Life and Times, J. A. R. Marriott, 1907.

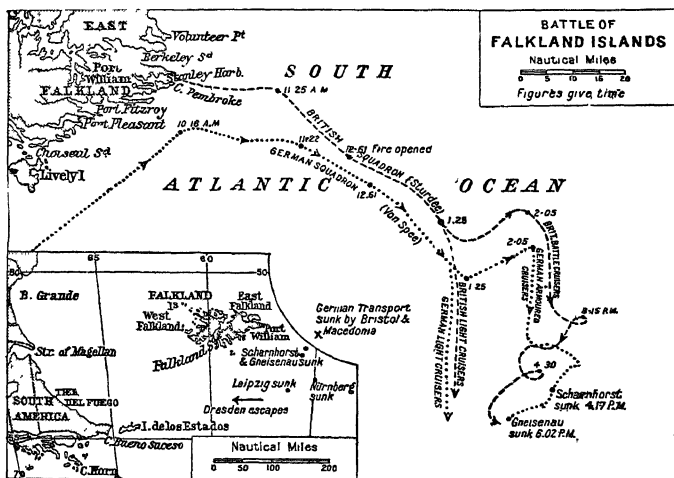
**Falkland Islands.** British crown colony in the S. Atlantic. The islands lie about 300 m. E. of the Strait of Magellan, and 1,000 m. S. of Montevideo. The group contains two large islands and about 100 small ones, with an estimated land area of about 4,618 sq. m., excluding S. Georgia, estimated at 1,000 sq. m. The chief are E. Falkland (2,580 sq. m.) and W. Falkland (2,038 sq. m.). The highest point is Mt. Adam (2,315 ft.) on W. Falkland. E. Falkland is hilly in the N., but low-lying, marshy, and boggy elsewhere. Trees are lacking, but grasses flourish; vegetables and green crops are cultivated. The coasts are much indented, affording good anchorage.

The chief industries are sheep-farming and whale fishing; horses and cattle are reared. Apart from the pastoral industry at the Falklands and the greatest whaling industry in the world carried on in the dependencies, there are few enterprises of commercial value. The exports are wool, whale products, and guano. At S. Georgia sealing is carried on. Stanley, the capital (pop. 1,246), is the only town; it is on E. Falkland, and possesses a good harbour. The climate in the Falklands, although bleak, is healthy. In the S. Orkneys, S. Shetlands, and Graham Land, the land is covered with

snow and glaciers, except in a few low-lying spots during the summer. The almost constant succession of strong winds, snowstorms, and fogs makes it a most inhospitable region. The only indigenous mammals are the fox and mouse, there being no traces of any aboriginal human inhabitants. Pop. of colony, including S. Georgia, est. 2,804.

The Falklands were discovered by John Davis in 1592, and taken by the French in 1764. The British recovered them three years later, but were ejected by the Spaniards, and it was not until 1832 that the group became British. Off these islands Sturdee won a naval victory over a German squadron, under von Spee, Dec. 8, 1914 (*v.i.*). After the entry of Japan into the Second Great War on Dec. 7, 1941, Imperial troops were sent to the Falkland Islands. The legislative council gave £50,000 to the imperial government for the purchase of aircraft, and introduced compulsory military service. For the diplomatic dispute of 1948 *see* in N.V. Argentina; Chile.

**Falkland Islands, BATTLE OF THE.** Naval engagement of the First Great War. It took place Dec. 8, 1914. The vessels engaged were on the one hand a German squadron under von Spee, consisting of the armoured cruisers *Scharnhorst* (flagship) and *Gneisenau*, the light cruisers *Nürnberg*, *Leipzig*, and *Dresden*, and three transports; on the British side, the battle cruisers *Invincible* and *Inflexible*, the armoured cruisers *Carnarvon*, *Cornwall*, and *Kent*, the light cruisers *Glasgow* and



Falkland Islands. Chart illustrating the course of the naval battle of Dec. 8, 1914. Inset, map showing position of the Falkland Islands relative to the mainland

Bristol, and two armed ships, all under Vice-Adm. Sturdee. The German squadron had recently destroyed two cruisers at Coronel (*q.v.*), and the two British battle cruisers were secretly dispatched to the Falklands to confront von Spee with overwhelming force.

The surprise was complete. While the British ships were coaling at Port William, von Spee, unaware of their presence, approached with the intention of seizing the naval base. On sighting the British battle cruisers (about 9.30 a.m.), the German squadron speedily turned about and set off E. at speed. At 10 the British ships put to sea in pursuit, with the Germans still in good view. The battle opened shortly before 1 p.m. The German light cruisers fled S., followed by the British cruisers. Sturdee engaged Scharnhorst and Gneisenau with the British battle cruisers in a running fight, going "all out" in a S.E. direction. Scharnhorst was sunk at 4.17 p.m. with no survivors. Gneisenau just before 6 p.m., with only 94 survivors. Leipzig and Nürnberg were sunk in separate actions. Dresden escaped for the time being, but the squadron as an active force was wiped out, the total German loss in men being 2,100. British losses were five killed and 16 wounded. Consult *The Official History of the Great War*, Vol. 1. Naval Operations, J. Corbett, 1920.

**Fall, THE.** Defection of the first human beings from a state of innocence. This is represented in the Eden story as an act of wilful disobedience, at the instigation of the serpent, to a command of God. As a consequence, Adam and Eve became conscious of guilt, and were expelled from the Garden of Eden. Theology teaches that the disobedience of our first parents had a threefold consequence in (1) a change of man's relation to God; (2) the loss of certain privileges connected with that relation; and (3) the beginning of a degenerative process which tended to make human nature more and more corrupt and alienated from God.

From this results the doctrine of original sin—that all men are born in a state of sin and are prone to wickedness as a result of Adam's fall. This may be viewed in two ways. Adam was the representative man and, with Eve, constituted the whole human family; so that the whole race fell in him. Or it may be viewed in connexion with theories of heredity, and sin be regarded as a mental

and moral tendency transmitted by natural generation. In any case, all orthodox theologians hold that original sin infected the race in all its individuals, and could be removed only by the act of God in Redemption through Christ.

In recent theological development there is a tendency to question the foundation on which the doctrine of original sin depends. This criticism rests on the following grounds: (1) the assumption that the human race started in a state of perfection is in conflict with the findings of modern anthropology and is difficult to reconcile with the doctrine of evolution; (2) the account of the Fall in Genesis does not contain the doctrine; (3) there is no definite trace of the doctrine in the rest of the O.T.; (4) the doctrine of original sin was the creation of the intermediate period between the O.T. and N.T., and first appears in Ecclesiasticus; (5) there is no hint of such a doctrine in the teaching of Jesus; (6) it is doubtful whether Paul accepted the full implication of the theory, though it must be admitted that there is one statement in his epistles (Rom. 5, v. 12) which seems to contain it; (7) the theory is difficult to reconcile with a true conception of Divine justice on the one side and human responsibility on the other. See *Sin*.

**Falla, MANUEL DE (1876–1946).** Spanish composer. He was born Nov. 23, 1876, and after studying in Madrid won the Spanish academy's prize for composition with an opera, *La Vida Breve*. During 1907–14 he lived in Paris, and then returned to Spain. His research on ancient folk-song influenced his own work, which developed an exclusively national manner. Ballets (*Love the Magician*, 1915, and *The Three-Cornered Hat*, 1919—the latter with choreography by Massine and settings by Picasso became a standard work of the Diaghilev company) were probably his most representative compositions. His other pieces included the impressionistic *Nights in the Gardens of Spain*, and *Pièces Espagnoles* for pianoforte. He died Nov. 14, 1946. Pron. *Fah-yah*. Consult *Manuel de Falla and Spanish Music*, J. B. Trend, 1930.

**Fallacy** (Lat. *fallax*, likely to deceive). An error in reasoning; a false argument that deceives or is intended to deceive. It may arise in the course of deduction or in the facts or observation on which reasoning is based. Thus, in the following argument, the

fallacy is obvious: Chimney-sweepers have black faces; that man has a black face; therefore he is a chimney-sweep. The fallacy is not so obvious in: We must keep out foreign goods, or our industries will be ruined. It took mankind thousands of years to appreciate the fallacy in the argument: As the sun rises in the east and sets in the west, it must revolve round the earth.

Particularly dangerous forms of fallacy are (a) "begging the question," or arguing in a circle, by assuming what has to be proved; (b) mistaking cause and effect; (c) thinking that because one event follows another, it must have been caused by it; (d) ambiguous use of words; (e) applying epithets, such as *disloyal*, *heretical*, *ridiculous*, to rebut statements. For a full classification of fallacies consult *System of Logic* (Book 5), J. S. Mill, 1843; *Elementary Lessons in Logic*, W. S. Jevons, 1870. See also *Syllogism*.

**Fallada, HANS (1893–1947).** A German novelist. His name was Wilhelm Friedrich Rudolf Ditzgen and he was born at Greifswald July 21, 1893. He won fame with a poignant study of post-war depression, *Kleiner Mann*—was nun? translated as *Little Man, What Now?* (1933). Other novels, all translated into English, are *Who once Eats out of the Tin Bowl*, 1934; *Once We Had a Child*, 1934; *Old Heart Goes A-Journeying*, 1936; *Wolf Among Wolves*, 1937; *Iron Gustav*, 1938. The juvenile element in Fallada's work was stimulated by the Nazi youth movement. A volume of fairy tales, *Hoppelpoppel, wo bist du?* was popular. Ditzgen, who lived on a farm in Mecklenburg during the Second Great War, died Feb. 6, 1947.

**Fallières, (CLÉMENT) ARMAND (1841–1931).** French statesman. Born at Mézin, Lot-et-Garonne,



Armand Fallières, French statesman

Nov. 6, 1841. He studied law in Paris, and became a barrister at Nérac, for which he was elected Republican deputy, 1876. He was under-secretary for the interior in Ferry's ministry, 1880, minister of the interior in 1882, 1887, 1889, of justice in 1887, of education 1883–1885, and president of the council in 1883. A senator in 1890, he was president of the senate 1899–1906.

He was elected president of France on Jan. 17, 1906, defeating Paul Doumer. Among the chief events of his term of office, which ended Jan. 7, 1913, were his visit to England in May, 1908, and the cementing of the Franco-Russian alliance. He died June 21, 1931. *Pron.* Fal-yair.

**Falling Leaf.** Evolution in aerobatics. The aircraft is made to start a spin in one direction, but just before the spin fully develops the controls are thrown over so that the machine is checked, pauses, and then side-slips over to start a spin in the opposite direction. The controls are again thrown over, reversing the spin once more, the evolution being repeated as often as the pilot desires. By alternating the spins the aircraft drops in the manner of a falling leaf.

**Falldon.** Seat in Northumberland, England, of Viscount Grey (1862-1933). It lies about 6 m. N. of Alnwick. From Falldon the statesman took part of his title; here he established a bird sanctuary; and here he died Sept. 7, 1933, leaving Falldon to his nephew, Sir Cecil Graves, joint director-gen. of the B.B.C., 1942-1943.

**Fallopian Tubes.** Two tubes, one on each side of the uterus or womb, which convey the ova or eggs from the ovary to the uterus. Each tube is about 4 ins. in length. The inner end opens into the uterus near its superior angle. The outer end opens into the peritoneal cavity, and terminates in an extremity in close relation to the ovary, and bearing a number of fimbriae or fringe-like processes which, by some mechanism not fully understood, attract and catch the ovum as it leaves the ovary.

**Fallopian** or **FALLOPIO**, GABRIELLO (1523-62). Italian physician and anatomist, discoverer of the functions of the Fallopian tubes (*v.s.*). Born at Modena, he studied medicine at Ferrara and other centres, becoming professor of anatomy at Ferrara. Afterwards he held the chairs of anatomy, surgery, and botany at Padua university, where he died Oct. 9, 1562. He published his *Observationes Anatomicae*, 1561, at Venice, where his works, *Opera Genuina Omnia*, were published in 1584.

**Fallow.** Term, derived probably from the Saxon *fealh*, a harrow, used to describe land that has been ploughed and harrowed but bearing no crop. The earliest rotation of crops was operated in the form of corn, fallow, since without cleaning it was impossible to

grow corn on land uninterruptedly year after year. Rotations persisted in this simple form until the introduction of more diversified crops such as turnips, swedes, and rotation grasses.

The beneficial effects of a fallow are biological, the ridding the land of weeds; physical, the improvement of the texture of the soil by the alternation of dryness and wetness; and chemical, arising from the accumulation of nitrates, and the liberation of mineral constituents such as phosphates and potash in a soluble form. Since the land is lost to cropping for a season when fallowed, the operation is an expensive one, and modern methods are designed to promote the cleanliness of land by cultivating crops which smother weed growth. In this category are rapes and kales, which are additionally valuable since they can be eaten off by stock, and thus not only keep weeds in check but enrich the soil, particularly when the stock receives concentrates in addition.

**Fallow Deer.** Small group of deer, which are characterised by having antlers round at the base and palmated above. They have small heads, rather large ears, and comparatively long tails, and usually stand about 3 ft. high. The hair is generally fawn colour, more or less dappled with white, but some local races lack the white spots, and are of such dark brown as to approach black. This is the deer generally kept in parks in Great Britain, and it occurs in a wild state in Epping Forest. It was probably introduced into Great Britain from the Mediterranean district at some early period. The huge extinct deer of Ireland, often erroneously called the Irish elk, was a gigantic species of fallow deer, and stood 6 ft. high at the shoulder, with antlers spanning over 11 ft. Its remains are also found in England and Scotland. *See* Deer; also Antler illus.

**Fall River.** City of Massachusetts, U.S.A. In Bristol co., it is a port of entry on Mount Hope Bay, 50 m. S.S.W. of Boston. It has an inter-urban electric rly. and a commodious harbour, with steamer connexion to New York and Philadelphia. Among the leading U.S. producers of cotton goods, it bleaches cloth and makes textile machinery, and also has oil refineries. Abundant water power is obtained from the Fall River and there is a hydro-electric plant on the Taunton. The first settlers received a grant from the Plymouth colony. Fall River was part

of Freetown until 1803, was called Troy until 1834, and received a city charter in 1854. Disastrous fires occurred in 1843 and 1928. Many French Canadians are among the pop. of 115,428.

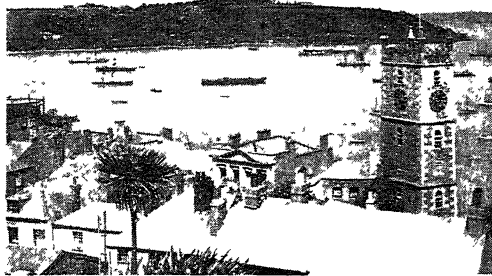
**Falls,** CYRIL BENTHAM (b. 1888). British military historian. Educated at Bradfield college and London university, he served with distinction in the First Great War. During 1923-39 he held an appointment in the historical section (military branch) of the committee of imperial defence. One of his major works was the preparation of the official history of the land campaigns of 1914-18. He was appointed Chichele professor of the history of war at Oxford university in 1946. Falls, who was military correspondent to *The Times* from 1939 and a frequent broadcaster on the course of the Second Great War, published *The Nature of Modern Warfare*, 1941; *Ordeal by Battle*, 1943; *The Second Great War, a Short History*, 1948. He contributed to this *Encyclopedia* the article *Europe, Western, Liberation of*.

**Fallujah.** Town of Iraq, standing on the Euphrates, about 40 m. W. of Bagdad. During operations against the Iraqi rebels in 1941, their transport was bombed at Fallujah on May 5. British troops occupied the town on May 19.

**Falmouth.** Mun. bor., seaport, and market town of Cornwall, England. It stands at the mouth of the Fal, 11½ m. S. of Truro with a station on a branch rly. It is a port of call, and has an excellent harbour, accessible to the largest vessels. The dry docks have been



deepened by 4 ft., and pneumatic plant and electric welding apparatus installed, and large vessels can now put in for repairs. Shipbuilding, engineering, brewing, and rope-making are prominent industries, and there is a considerable pilchard fishery. Falmouth exports tin. Its equable climate, abundant sunshine, and the scenery of the Fal valley make it a favourite watering-place. Here are the headquarters of the Royal Cornwall Yacht Club, and all the usual holiday sports are catered for. The corporation maintains the markets, library, and pleasure grounds. Great improvements have been made along the sea front, a sub-tropical garden having been laid out and a concert pavilion erected.



Falmouth. The harbour of this Cornish seaport and market town at the mouth of the River Fal

On a peninsula S.E. of Falmouth Bay stands Pendennis Castle. Falmouth and Camborne elect an M.P. Market day, Sat. Pop. 15,500.

**False Acacia** (*Robinia pseud-acacia*) OR LOCUST-TREE. Tree of the family Leguminosae, native of N. America. It attains a height of 60–80 ft. Its long, narrow leaves are broken up into 5–12 pairs of oval leaflets, and at the base of the leafstalk are two stipules which, on the non-flowering branches, become hardened into persistent spines. The fragrant flowers are produced in long, pendent sprays, like those of the laburnum, but are white instead of yellow. The seed-pods, too, are like those of laburnum, but dark red in colour. The wood, though hard and durable, is liable to crack and is little used.

**False Antiquities.** Alleged relics of the human past forged, deliberately falsified, or erroneously attributed. The chief motives for their production are desire for gain and love of mystification. Production of copies of genuine originals (coins, scarabs, paintings, porcelain) with a fraudulent intention is on a different plane. To a special category should be referred such literary deceptions as Bertram's fabrication (see Bertram, Charles Julius). Among famous modern forgeries are those of Shapira, a Pole, who sold a collection of spurious Moabite pottery to the Prussian government for £3,000, and afterwards offered the British Museum an alleged Mosaic MS. on leather. The Louvre Museum, Paris, acquired, in 1896, for £8,000, a gold tiara inscribed to a Scythian king, Saitarpharnes, which was found in 1903 to have been produced in Odessa by a Russian workman. In 1908 scarabs recording the circumnavigation of Africa under Pharaoh Necho, led to a conviction for fraud. False prehistoric remains have fur-

nished the forger with a profitable field. Fifty years ago chipped flints were openly manufactured by Edward Simpson (Flint Jack). Meillet of Poitiers published grotesque Palaeolithic engravings in 1864.

Experts allow themselves sometimes by self-deception to attribute antiquity to

modern relics, as when W. Bode acquired for Berlin in 1909 a wax bust made by an English sculptor, Lucas, and claimed it as the work of Leonardo da Vinci. In 1947 a Dutch painter, H. van Meegeren, was imprisoned for passing off several of his own paintings as works by Vermeer. See Imposture; also Literary Forgery. Consult Archaeology and False Antiquities, R. Munro, 1905; Forged Egyptian Antiquities, T. G. Wakeling, 1912.

**False Bay.** Inlet of the Atlantic Ocean, on the E. side of the Cape of Good Hope. The Cape of Good



False Acacia. Flower of the locust-tree of North America

Hope and Hangklip Cape form the W. and E. extremities. Its length is 22 m. and its breadth 23 m. On the western shore is Simonstown (q.v.), a major naval base.

**False Point.** Cape and port of India. In the Cuttack district of Orissa, the cape is on the Mahanadi estuary, and is situated in 20° 20' N. and 86° 47' E. It is so called from being mistaken by seamen for Point Palmyras, 1° farther N. The port (opened 1860) has the best harbour, safe and completely landlocked, between Bombay and Calcutta, and there is canal communication with the interior of Orissa.

**False Pretences.** Term used in English law. It is a misdemeanour by statute to obtain or attempt to obtain money or property by false pretences. The pretence must be false; it must be a statement of fact and not merely of intention; the person making it must know it to be false; by it the other person must be induced to part with the money, etc., and it must be done with intent to defraud. The pretence may be made otherwise than by words—e.g. a man in an undergraduate's cap and gown enters a shop in Oxford and obtains goods on credit. He has represented himself to be an undergraduate of the university. Maximum punishment is penal servitude for five years, or imprisonment with or without hard labour for two years. Larceny by trick must be distinguished from false pretences. See Larceny.

**False Relation.** In harmony, one note following a different note of the same letter in another part, e.g. C sharp in alto followed by C natural in tenor, in successive chords. It is not permitted in strict harmony, but is condoned if, using the above example, both parts have C sharp in the first chord.

**Falsetto** (Ital.). Term applied to a kind of high voice of men, who discard the natural pitch of speaking and singing in order to cultivate extreme high notes and sing an alto part. It is produced, according to some, by allowing only a short length and a portion of the breadth of the vocal cords to vibrate, instead of the whole. There are a few natural adult alto voices, but most choir singers who adopt this part are baritones or tenors, using their falsetto range. See Voice.

**Falsification.** Term meaning making false. It is chiefly used in connexion with accounts. The falsification of accounts by a clerk or servant with intent to defraud is by English law a misdemeanour punishable by penal servitude. It is also an offence to falsify the service certificate of a seaman or soldier. Some forms of falsification come under the heading of forgery (q.v.).

**Falstaff**, SIR JOHN. Comic character of Shakespeare. He has the principal part in both the plays named after King Henry the Fourth, and in The Merry Wives of Windsor. In Henry IV (1) he is the companion of the prince who becomes Henry V, and leader of a crowd of rascals; in Henry IV, (2) though he dominates the action, he has only one scene with the prince and is finally rejected by him. Falstaff's death is related in King Henry the Fifth. The

Merry Wives of Windsor was written at the desire of Queen Elizabeth, who wished to see the fat knight in love; but the Falstaff here presented is a shadow of the original, who was assumed to have been modelled on Sir John Oldcastle (*q.v.*). For the wit which enables Falstaff triumphantly to carry off any situation, all his faults—cowardice, lying, drunkenness, grossness—are forgiven; he has “more flesh than another man, and therefore more frailty.” He emerges as the supreme comic creation in English literature; “I am not only witty in myself, but the cause that wit is in other men.” Notable interpreters of the part include Beerbohm Tree, George Robey, Robert Atkins, Ralph Richardson. Falstaff is the subject of operas by Verdi and Vaughan Williams (Sir John in Love) and a symphonic study by Elgar. Consult The Fortunes of Falstaff, J. Dover Wilson, 1943.

**Falster.** Island of Denmark. It lies to the S. of Zealand, between Moen on the E. and Maribo on the W., separated from them by narrow straits. It is 28 m. from N. to S., with a maximum width of 15 m. The surface is fairly level, but low and marshy near the coast, where malaria is endemic. The island is fertile and cultivated; stock-raising, dairy-farming, and agriculture are the principal occupations. Sugar-beet and fruit are the chief crops. The largest towns are Nykjøbing and Stubbekjøbing, connected by rly. Area 183 sq. m. Falster forms with Maribo a county. Pop. of island, 51,392.

**Falun.** This Swedish town is described under its alternative name Fahlun.

**Faluns** (Fr.). Series of loose, sandy shell-beds, of Miocene age. They occur in the Touraine area of the S.W. part of France. Of marine, shallow-water origin, they often contain numerous fossils.

**Fama Clamosa** (Lat., crying report). Term used in Scottish Church law for any public scandal against a minister with which the authorities find it necessary to deal. The charge must be maintained by some responsible person who is prepared to prove it, or it must be a matter of such notoriety that no special complainant is necessary.

**Famagusta** (Lat. *Fama Augusta*). Seaport of Cyprus. It stands on the E. coast, 3 m. S. of ancient Salamis. The cathedral of S. Nicolas and a castle are notable features of the town. The harbour improvements were finished in 1906, and a narrow gauge rly. con-

nects the town with Nicosia and Kalokhorio in the W. (71 m.). Agriculture is the chief occupation, and the town is noted for its pomegranates. The original Roman walls were strengthened by the Genoese and Venetians, and are still fairly well preserved. Here, in 1191, Guy de Lusignan (*q.v.*) was crowned king of Cyprus by Richard I. The town flourished under Venetian rule (1487–1571), but later was taken by the Turks, when its prosperity began to decline. An earthquake in 1735 destroyed it. Famagusta gives its name to an admin. dist. Pop. of town, 10,412.

Jews stopped while attempting to enter Palestine illegally were placed in a camp near Famagusta from Aug., 1946, and admitted gradually under the quota system until the British withdrew from Palestine, 1948. All who remained were admitted by Israel, the camp being cleared Feb. 10, 1949.

**Famatina.** Range of mts. in Argentina. An eastern portion of the Andes, in La Rioja prov. it rises to more than 20,000 ft. The town of Famatina is the headquarters of a mining region and is connected by rly. with Córdoba to the S.E.

**Famatinite.** Greyish copper mineral, copper antimony sulphide, often occurring intergrown with enargite, copper arsenic sulphide, in vein and replacement deposits; also associated with pyrite, tetrahedrite, chalcopyrite, barite, and quartz.

**Famennian.** Uppermost stage of the Devonian system of stratified rocks. It is well developed in Belgium and N. France, where it consists of fossiliferous shales and sandstones, and in Rhineland, where limestones also are developed. Beds of slate near Ashburton and the Petherwin beds near Dartmoor belong to this stage. The name is taken from the slates of Famenne (Belgium).

**Familiar** (Lat. *familiaris*). In the Roman Catholic Church, a person who belongs to the household of a pope or bishop. He must at least reside in the same diocese. The office became at one time an easy ladder to ordination and preferment. Consequently, the council of Trent decreed that a familiar could not be ordained by his bishop unless he belonged to the same diocese and had lived with him three years. Familiars of the Holy Office were officials of the Inquisition (*q.v.*) charged with the duty of arresting and imprisoning persons suspected of heresy or other offences against the spiritual authority. The name is explained

by reference to their admission into the confidence of the Holy Office, as members of the family.

Familiar was also the term applied to the spirit supposed to be in the service of necromancers and witches, incarnate sometimes in the form of a black cat or other animal. In this instance the idea was derived from the universal belief in a daemon, tutelary genius, or guardian angel associated with an individual from the moment of birth. See Demonology.

**Famille Jaune** (Fr.). Much of the finest old Chinese pottery is classified into family coloured groups, according to the predominating tints used. The most esteemed are the *famille rose*, *noire*, *jaune*, and *verte* (rose, black, yellow, green). See Pottery.

**Family** (Lat. *familia*). Group comprising father and mother, with their offspring. The unit of human society, its roots are traceable in the primeval life of mankind. The first attempt to elucidate the origin of family life was Maine's patriarchal theory (1861). Based on Roman models, it assumed that the primitive father possessed uncontrollable power, the *patria potestas*, over his household. This view was impugned by MacLennan (1865), who postulated a primeval promiscuity, out of which emerged matriarchy, attributed to uncertain paternity; and exogamy, due to the theoretic kinship of the maternal clan; while communal marriage ultimately broke up into polyandry and polygyny. Working on similar material Lewis Morgan (1870) observed that in primitive communities it was more customary to denote kinship by “classificatory” than by “descriptive” terms. The main classes were five in number, a man using the same words for all persons within the clan of the generations of his grandparents, parents, brothers, children, and grandchildren respectively. These systems were hailed as further evidence of a stage of communal marriage preceding the growth of family groups.

Westernmark (1891) reverted to Darwin's view (1871) that the family was from the beginning based upon the supremacy of the individual father. When the “matrimonial classes” of the Australian aborigines, based on the totem, were studied by Spencer and Gillen, Howitt, and others, they were held to point to a primitive form of group-marriage. Subsequently, Atkinson and Lang

(1903) suggested that the prohibition of marriage within an incest-group—whence exogamy sprang—was due to the jealousy of the sire. The theory of promiscuity is inconsistent with the evidence; the widespread variants of the normal family are explicable on other grounds.

In polygynous societies the family is composed of sub-families, which under the system of concubinage tend to become subordinate to that of the chief wife. The closer social relationship of the mother with her own children obscures the paternal status; one outcome of this is the toleration of union with the half-sister, e.g. Abraham and Sarah.

The matriarchal system, imposing rights and duties towards the child, first upon the kinship group, and afterwards, as their representative, upon the mother's brother, is a widespread social device for securing the observance of tribal law. It may be reasonably attributed to the beginnings of agriculture at the end of the Neolithic age, having been found in Europe by the Aryan-speaking peoples who spread westward, bringing new conceptions of father-right that lay at the base of patriarchal society. This view is confirmed by the matriarchy of early Egypt, and by the fact that patriarchy was well established at the dawn of Semitic history, which antedated the Aryan family.

In aboriginal America, where social organizations were developed on the neolithic foundation brought from Eurasia, the family—in the sense of the household or "house-fire"—is traceable at every cultural level. See Kinship; Marriage; Society.

**Family.** In classification of plants and animals, a group of genera which resemble one another but are not marked by such important distinctive features as to justify making them into an order. For example, the domestic dog belongs to the genus *Canis*, which, with three other living and several extinct genera, is included in the family Canidae, or dog-like mammals; this family forms a group of the order Carnivora. See Classification, table, pp. 2136–37.

**Family Allowances.** Term used for state assistance to families with children. France, in 1913, and Germany, in 1936, introduced such allowances, with the object of raising the birth rate. In the British Commonwealth they have found a place in social security schemes. Australia, under the

Child Endowment Act, effective July 1, 1941, made an allowance of 10s. a week for each child under 16 after the first; New Zealand from April 1, 1946, allowed 10s. a week for each child under 16; Canada by an Act of 1944, effective July 1, 1945, gave \$3 to \$8 a month for each child under 16 for families with less than \$1,200 a year.

In the U.K. an Act of June 15, 1945, effective Aug. 6, 1946, provided for an allowance of 5s. a week for each child after the first until July 31 following the 16th birthday of a child continuing full-time education. The ministry of national insurance administers the Act; payments are drawn at post offices. Where husband and wife live together, or a wife separated from her husband has the children, the allowance belongs to the wife. At the beginning of 1949 there were 2,900,000 families drawing allowances for 4,600,000 children. *Consult* Family Allowances, E Rathbone, new ed. 1949.

**Family Compact.** Arrangements made in the 18th century between the kings of France and Spain for the maintenance of an alliance between them, the Bourbons being the family then ruling over both countries. On Nov. 7, 1733, France and Spain signed a secret treaty directed against Austria, with whom war quickly followed. In Oct., 1743, this alliance was renewed in a new family compact, directed mainly against Great Britain, with whom Spain, but not France, was then at war. War between French and British quickly followed. A third was made in 1761, when the Seven Years' War was raging. By this Spain entered the war.

The term family compact was applied to the domination of Upper Canada, or Ontario, by a narrow circle of men, attached to England and the English church, in the early 19th century.

**Family of Love** or **FAMILISTS.** Religious sect, founded by Henry Nicolaes, or Nicholas (c. 1502–80). Influenced by the mystical teachings of David Joris (1501–56), he claimed to be a recipient of divine revelations. The sect made its way to England in the reign of Edward VI, and had a few scattered followers. They taught that no one outside their sect could have a true knowledge of God; gave all the chief doctrines of Christianity a purely allegorical interpretation; and were extreme antinomians in practice as well as in theory. They became extinct about the middle of the 17th century.

### Family Welfare Association.

Formed in London in 1869 as The Society for Organising Charitable Relief and Suppressing Mendicancy. This name was later changed to Charity Organisation Society, and on Feb. 1, 1946, to Family Welfare Association. The chief work of the association is the development of family case work, which is the art of helping people in trouble to make the best use of their own capacities, with the cooperation of their family and the community, to overcome difficulties. It also seeks to unite in common action all persons and agencies engaged in family case work and to encourage developments necessary to meet new social needs. It takes an active part in social research and in practical schemes for raising the standard of living. Its London district committees maintain centres for social service representative of the life and work of the district. The offices are at Denison House, 296, Vauxhall Bridge Road, London, S.W.1.

**Famine** (Lat. *fames*, hunger). Period of want or scarcity of food supplies, usually confined to a more or less restricted locality. Its chief primary cause is deficiency of rainfall, but floods, frosts, storms, visitations of insects or other pests, inadequate agricultural methods, ill-directed labour, deficient transport, and the ravages of war are contributory causes. Neglect in the storage of food frequently brings about famine among primitive peoples, but it is sometimes to be accounted for by less obvious reasons, such as wholesale deforestation, which gives rise to local conditions of drought, and the dependence of a group upon one kind of food, as maize in S. America, rice in China, or the potato in Ireland.

Although scarcity is only partially preventable, the careful organization and governmental supervision of agricultural production in most parts of Europe and America have virtually freed civilization from the dread of starvation in normal circumstances. But all the foresight and accumulated experience of man is by no means equal to combating the conditions of serious dearth which follow prolonged hostilities. During and after both the Great Wars famine, or near famine, spread widely throughout Europe, especially in Russia, Germany, Austria, the Balkans, Czecho-Slovakia, and certain parts of France and Belgium.

The greatest recorded famines occurred at a fairly early period in



history, when the world was entirely dependent upon local and circumscribed supplies. In 439 B.C. Rome was visited by a famine so severe that thousands cast themselves into the Tiber. In Egypt famine lasted A.D. 1067-72, while in 1005 Saxon England, and eleven years later the whole of Europe, experienced a prolonged period of terrible dearth. Another great European famine occurred in 1162, driving the population in many countries to cannibalism and to brigandage. Ireland has frequently suffered from periods of scarcity, especially severe visitations occurring in 1491, 1822, and from 1846 to 1847, when the potato crop failed with consequences of the most disastrous kind, thousands perishing from the "famine fever" which followed. In the period of dearth which followed the Thirty Years' War in Germany multitudes perished from hunger.

One of the most disastrous famines in modern Europe was in Russia in 1921. At the height of the shortage caused by agricultural disruption following the revolution, a quarter of the Russian people were on the verge of starvation. An American relief administration expended £12,000,000 in providing and distributing 800,000 tons of food amongst 10,500,000 people.

N. China suffered widespread famine in 1877-78 and in 1920. In India a million persons died of starvation in the famine of 1866 and

1½ millions in 1869, and the famine of 1899-1900 cost a million lives. A famine in Bengal in 1943, resulting from the failure of the Indian rice crop and the absence of supplies from Japanese-occupied countries, caused the death from starvation and the resultant cholera epidemic of an estimated 1,500,000 persons.

**Fāmūd** OR FAEMUND. Lake of Norway, in Hedmark co., near the Swedish border. It lies in a mountainous district, at an alt. of 2,199 ft., 85 m. S.S.E. of Trondhjem. It is 37 m. long from N. to S., with a maximum width of 5 m.

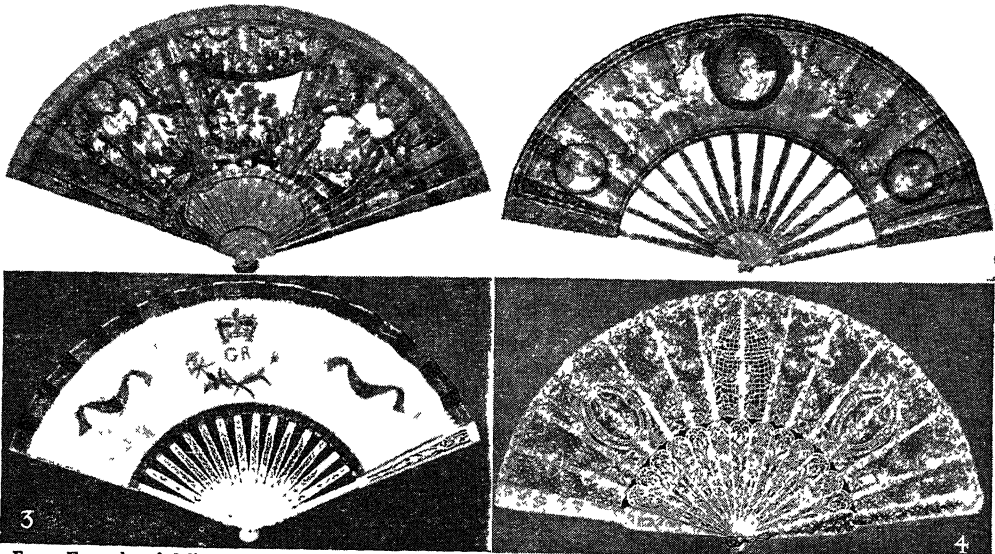
**Fan** (Lat. *vannus*). Implement for agitating the air, especially used for cooling the face. Fans have been used from the earliest ages in hot countries, and in their primitive form they were made of feathers stuck into long handles. In Europe they came into general use in the 16th century, and were known as early as the 14th century, having probably been introduced from the East. They were usually made of feathers, straw, silk, etc., with handles of ivory, gold, silver, and wood, often richly carved and encrusted with precious stones.

The folding fan, an invention of the Japanese, was adopted in Europe towards the end of the 16th century. Fan painting became an art in the middle of the 17th century, and printed fans, illustrating pastoral scenes, and reference to politics, etc., also became the

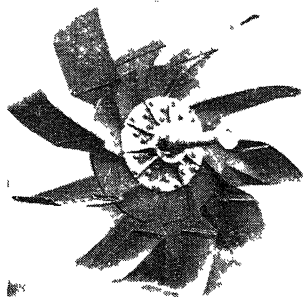
vogue. Fans have always played a symbolic part in ceremonial, and even now are used in the East, and are carried on state occasions in papal processions in Rome. See Punkah: *consult also* Fans and Fan Leaves, collected and described by Lady C. Schreiber (English), 1888 and (Foreign) 1890; History of the Fan, G. W. Rhead, 1910.

**FAN PAINTING.** Both folding and non-folding fans have been the object of elaborate decoration. Antoine Watteau, Nicolas Lancret, Jean Baptiste, Joseph Pater, François Boucher, and other 18th century French artists produced fans of incomparable beauty. Among English artists who have practised the art the most notable was Charles Conder (1868-1903), who in this genre was no mean rival of Watteau himself.

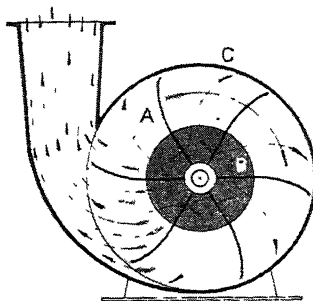
**Fan.** Mechanical appliance for moving air or other gas. There are two main types: the propeller fan, resembling in shape and principle a screw propeller; and the centrifugal fan. Fans are used to move air for ventilation purposes (e.g. the small portable electric fan which sets up a current of air within a room); or (extractor fans) to withdraw used air from a public building. These duties are performed by propeller type fans when little resistance to the flow of air from them is likely, since this kind of fan mainly speeds up the flow of air and does not greatly increase its pressure.



Fan. Examples of delicate and artistic work. 1. Richly painted gilt fan, decorated in Vernis Martin lacquer, period of Louis XIV, formerly belonging to Queen Victoria. 2. Silk fan with medallions painted by F. Boucher (1708-70). The ivory stick is carved and enriched with gold. 3. English fan made to commemorate the recovery from illness of George III in 1789, now in the British Museum. 4. White lace fan mounted on mother-of-pearl, formerly belonging to the Empress Eugénie



Fan. Standard centrifugal ventilating fan and, right, sectional diagram.  
A, fan-wheel; B, air-inlet; C, casing; course of air indicated by arrows

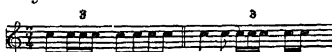


Centrifuga fans are installed when there is considerable resistance to be overcome (*e.g.* when the ventilating system includes lengths of duct or trunking, through which the air must be forced on its way to or from a building). Whereas in a propeller

Fanar, the Turkish name for that quarter of Constantinople which was inhabited by Greek residents. Members of this class, by means of a recognized system of bribery, obtained nomination as rulers of principalities such as Wallachia, and set themselves to recoup their expenses by unscrupulous taxation. The system of appointing fanariotes was dropped in 1821.

**Fancy.** Shortened form of phantasy. It means primarily any creation of the imagination. From this it came to be used for an inclination or liking, and thus we speak of fancying anything, and have the phrase bird fancier. The fancy is sometimes a term for followers of pugilism, while De Quincey uses it for lovers of rare books. Fancy goods as a trade term refers to the lighter and supplementary forms of women's dress, such as ribbons, gloves, veilings, etc., also to handbags and articles used to ornament rooms, such as silver vases, picture frames, and the like and to various "gadgets" suitable for presents.

**Fandango.** Spanish dance. It is usually accompanied by castanets to reinforce the strong rhythm, as well as by melodic instruments. It is danced by two people to triple time. A characteristic rhythm of the music is:

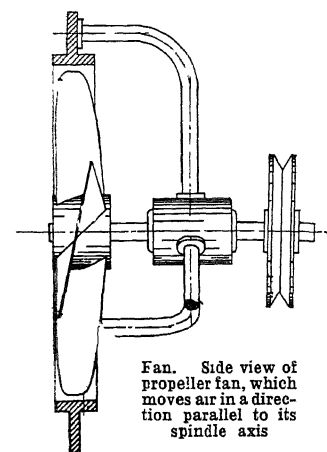


See Castanets.

**Fanfare** (Fr.) OR FLOURISH. Properly, a short passage for trumpets in unison, performed on state occasions. That used at the opening of parliament dates from the reign of Charles II. Some com-



Fanfare sounded by state trumpeters



Fan. Side view of propeller fan, which moves air in a direction parallel to its spindle axis

type fan the air is discharged in a direction parallel to the axis or spindle of the fan, in the centrifugal fan the air is drawn in axially at the centre and discharged at the periphery. The blades are curved and are enclosed in a casing of volute shape. In mechanical ventilation systems the spent air is usually removed by extraction, so inducing a flow of fresh air from outside through the many apertures at doors and windows. Fans are also used to force air into rooms, or to provide a forced draught to a furnace. See Boiler; Draught; Ventilation.

**Fanariotes** OR PHANARIOTES. Name given to the aristocratic Greek class in Constantinople (Istanbul) prominent during the 18th century as governors of the E. European provinces of the Porte. The word is derived from

posers have used fanfares in opera, notably Beethoven. Spontini, Ambroise Thomas, and Wagner.

**Fang.** A specialised tooth in poisonous snakes by which the venom is conveyed into the wound caused by the bite. In the viper tribe the fangs are channelled, so that the venom, exuding from the tip of the tooth, is conveyed to the deepest part of the wound. In certain other snakes the fang is simply grooved, and most of the venom merely reaches the surface. The fangs may be either at the front of the jaw or at the back; with the latter arrangement the bite is seldom dangerous to man, though it may be fatal to small animals. The fangs usually fold back against the jaw when not in use. The venom is forced through the fang partly by constriction of the venom bag, partly by pressure on the base of the fang in the act of biting.

**Fang** OR PANGWE. Negro tribe of the French Gabon colony and Spanish Guinea. Their debased Bantu speech, including the Maké dialect, is spoken within the coast-highland region bounded by the Ogowe, Ivindo, and Campos rivers. Well-built, slim, 5 ft. 7 ins. in height, bronze-coloured, bearded, intelligent, they display Hamitic elements, having migrated due W. from the valleys of the N. Congo affluents about 1850, driving the weaker aboriginal negroes before them. They are hunters and fishers, using cross-bows and throwing-knives, and are adept potters and ironworkers. The men wear bark waistcloths, the women grass girdles.

**Fanmakers' Company.** London city livery company, incorporated on April 19, 1709. Its offices are situated at 23a, Lime Street, London, E.C.3.

**Fannich.** Loch in the centre of Ross and Cromarty, Scotland. The loch is 6½ m. E.-W., and 1 m. N.-S., and is drained by Fannich Water, 6½ m. long. The Fannich Mts. (highest peak Sgurr Mor, 3,637 ft.) and Fannich Forest (20,000 acres) lie to the N. of the loch. Under the



Fanmakers' Company arms

North of Scotland Hydro-Electric Board construction scheme, work commenced in 1946 to utilise Loch Fannich as a reservoir to feed a power station at Grudie Bridge in Strath Bran.

**Fanning.** A coral island in the Pacific Ocean, lying due S. of the Hawaiian Islands in lat. 3° 50' N. and long. 159° 20' W. Administratively it is annexed to the Gilbert and Ellice Islands Colony, and is a station of the submarine cable between Australia and Vancouver. It exports mother-of-pearl, and there are guano deposits. Area, 15 sq. m. Pop. 255. The name is also applied to a neighbouring group, viz. Christmas, Jarvis, Washington, and Palmyra, the last being claimed by the U.S.A. The total land area is about 260 sq. m. They were discovered in 1798 by Edmund Fanning.

**Fanning, EDMUND (1737-1818).** American soldier. Born at Long Island, New York, he graduated at Yale in 1757. He became a lawyer in N. Carolina, and occupied various posts in the local government, where his malpractices and subservience to the home government earned for him unpopularity. In 1774 he was made surveyor-general, and in 1777 he raised a regiment to combat the revolution. Colonel in the British army in 1782 and governor of Prince Edward Island in 1787, he became major-general in 1794 and general in 1808. In those years he did some voyaging in the Pacific. He died in London, Feb. 28, 1818.

**Fanning, JOHN THOMAS (1837-1911).** American engineer. Born at Norwich, Conn., he was there educated. He became an engineer, but left his profession to serve the North in the Civil War. He was for nearly fifty years one of the leading authorities on hydraulics, being concerned in the construction of numerous waterworks and similar undertakings in the U.S.A. He was chief engineer of the water-power company at St. Anthony Falls. His Treatise on Hydraulic and Water Supply Engineering, 1877, was long the best American book on the subject.

**Fannius, GAIUS (fl. 2nd century B.C.).** Roman annalist. He served in Africa, where he and Tiberius Gracchus were the first to mount the walls of Carthage 146 B.C., and in Spain 142. Through the influence of Gaius Gracchus he obtained the consulship 122, but when the former proposed to confer full citizenship upon the Latins, Fannius opposed him in a famous speech. Orator, advocate,

and student of philosophy, Fannius was best known for his *Annales*, a history of Rome from the earliest days down to his own times. The work enjoyed a high reputation, and was used by Plutarch in his *Lives* of the Gracchi.

**Fanö.** Island of Denmark. It lies off the S.W. coast of Jutland, and its N.E. point faces Esbjerg on the mainland. It is 11 m. long and from 2 m. to 3 m. broad. There are three small towns on the island: Fanö, a health resort on the W. coast; Nordby, on the N.E. coast; and Sønderho, in the S. Fishing is the main industry. Area, 20 sq. m.

**Fano** (anc. *Fanum Fortunae*). Port and seaside resort of Italy, in the prov. of Pesaro. It stands on the Adriatic, 8 m. by rly. S.E. of Pesaro. It is mainly enclosed by medieval walls, with the bastions facing the sea. Its cathedral and churches contained many pictures by old masters. Nearly all these buildings were mined and heavily damaged by the Germans in the Second Great War, during which Fano was taken by Polish troops of the 5th army, Aug. 27, 1944. The town possessed a fine theatre, formerly a palace, the remains of a triumphal arch of Augustus, and a palace of the Malatesta. Fishing is the chief occupation of the inhabitants, and there is trade in corn, oil, and silk. The old harbour has silted up, and shipping is now conducted through a canal to the sea. Here, in 1514, the first printing press with Arabic type was set up. The Roman city owed its origin to a temple of Fortune commemorating the defeat of Hasdrubal on the Metaurus. Pop. 26,928.

**Fan-palm** (*Livistona*). Genus of trees of the family Palmae. They have very large, fan-shaped,



Fan-palm. Leaves of *Livistona chinensis*, a species from S. China

plaited leaves, and are natives of Eastern Asia, Malaya, and Australasia. The best-known species are *L. australis*, from Eastern Australia, and *L. chinensis*, from S. China.

**Fanshawe, SIR RICHARD (1608-66).** English diplomatist and writer. Born at Ware Park, Herts, he was



Sir R. Fanshawe, English diplomatist After Harding

appointed in 1635 secretary to the embassy at Madrid. About 1644 he became secretary to the prince of Wales, and in 1648 was made treasurer of the navy under Prince Rupert. He was created a baronet in 1650. After the Restoration he sat in Parliament for Cambridge university from 1661 until his death, and undertook various missions to Spain and Portugal. He translated the *Lusiads* of Camoens (in captivity after the battle of Worcester), 1655; and Guarini's *Pastor Fido*, 1647. He died June 26, 1666.

**Fantaisistes.** Group of French writers who, in reaction against symbolism and romanticism, continued the traditional vein of Gallic irony, deriving inspiration from Villon and from the *grotesques*, especially La Fontaine. Accomplished craftsmen, they eschewed the laxities of the modernists. Théodore de Banville and later Jules Laforgue and Paul Jean Toulet were forerunners of *fantaisisme*, and the most important figures in the group were Tristan Derème (b. 1889), Tristan Klingsor (b. 1874), Jean Marc Bernard (1881-1915), the Belgian Théo Varlet (1878-1938), Jean Pellerin (1885-1920), and Léon Vézane (b. 1885). Francis Carco (b. 1886) and Pierre MacOrlan (b. 1883) turned from poetry to the writing of realistic fiction.

**Fan Tan.** A Chinese gambling game. The implements for playing consist of a bowl full of beans or counters and an oblong card, placed on a table, the corners of which are numbered, or assumed to be numbered, from 1 to 4: the lower right hand corner being 1, the top right hand corner 2, the top and bottom left hand corners 3 and 4 respectively. Or in place of the card a corresponding oblong space is chalked upon the table. Bets are made upon these separate corners, which are decided by the banker taking a handful of beans or counters, and dividing them into fours; the number of odd pieces over deciding the winning number. If there is no remainder, No. 4 wins.

An American variety is played with an ordinary full pack of cards, by any number of players up to eight. One card is dealt to each player, the remainder forming

the stock and being placed face downwards upon the table. Each player contributes a fixed stake. Unless an ace has been dealt to him, each player draws a card from the stock in rotation until he obtains an ace; each time he fails to do so, paying an ante or stake, which continues until all four are drawn by one or other of the players. The aces are laid side by side as they are turned up, and the different suits are built upon them, from ace to king. The player who first gets rid of all his cards takes the pool. See Gaming.

**Fantasia** (Ital.). Musical composition in which strict form is not exacted, and everything is left to the "phantasy" of the composer. In different centuries and countries, this term and similar ones—fancy, fantasie, rhapsody, phantasy, etc.—have denoted greatly varying types of music, but all possessing the idea of freedom from the more formal designs of their periods and surroundings. These terms have covered alike the naive old contrapuntal string trios of Orlando Gibbons (early 17th cent.), the monumental organ fantasias of J. S. Bach (early 18th cent.), and much worthless pianoforte music of the 19th century.

**Fantasia.** Film by Walt Disney, made in Hollywood, U.S.A., and shown in the U.K. in 1941. The artist's aim was to depict in coloured cartoons the stories, patterns, etc., suggested by listening to eight pieces of classical music: Bach's toccata and fugue in D minor, Tchaikovsky's Nutcracker suite, Dukas's Sorcerer's Apprentice, Stravinsky's Rite of Spring, Beethoven's sixth symphony, Ponchielli's Dance of the Hours, Moussorgsky's Night on the Bare Mountain, and Schubert's Ave Maria. The orchestra was conducted by Leopold Stokowski, and Deems Taylor spoke a commentary. Disney's imaginative powers were fully extended in creating themes which ranged from abstract design and fairylike beauty to broad comedy.

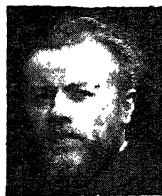
**Fantastic Symphony.** Composition by Berlioz (Op. 14). It has for sub-title *Épisode de la Vie d'un Artiste*, and is a notable example of telling a story in music. This story concerns a young musician who, having tried to poison himself with opium, is thrown into a highly nervous condition; his sensations and memories find utterance in the form of musical imagery. The image of the beloved recurs in idealised, then distorted form throughout

the five movements: Introduction, Un Bal, Scène aux Champs, Marche au Supplice, and Songe d'une Nuit de Sabbat. Reputed to have been inspired by Henrietta Smithson, the symphony was first played in Paris in 1832. It was performed as a ballet (with choreography by Massine) by the de Basil company at Covent Garden in 1936.

**Fanti** (cabbage-eaters). Negro people in the Gold Coast colony, W. Africa. They are allied to the Ashanti (q.v.), and their number is estimated at 1,000,000. They are muscular, round-headed, chocolate-hued, of medium stature, and live in small village-communities, and on the coast. Their tribal scars are three lines on each side of the jaw-bone. Their Tshi dialect is the dominant speech round Cape Coast Castle. Ceremonial cannibalism formerly prevailed among them.

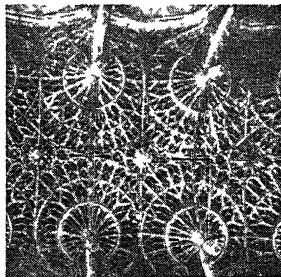
**Fantin-Latour,** IGNACE HENRI JEAN THÉODORE (1836–1904). A French painter. Born at Grenoble, Jan. 14, 1836, he went to Paris to study at the Petit École. As a result of exhibiting three portraits in 1859 he became acquainted with Manet (whose portrait he painted), but remained uninfluenced by the new

school. He combined realistic technique with the vision of a poet, and imbued his portraits with great fidelity. Many were of his friends, among them Baudelaire, Verlaine, Rimbaud, Whistler, grouped in such pictures as *Homage to Delacroix*, *The Corner of the Table*, *The Dubourg Family* (Louvre), and Mr. and Mrs. Edwards (National Gallery). Fantin-Latour was known as a great painter of flowers before his genius in portraiture was fully revealed. His cool, delicate colour and precision of construction are remarkable. A study of roses by him is in the National Gallery. The British Museum has a collection of his lithographs. He died at Bure, Orne, Aug. 28, 1904. A study of his art by F. Gibson appeared in 1924.



**Fantin-Latour,**  
French painter.  
Self-portrait in Uffizi  
Gallery, Florence

**Fan-Tracery.** In Perpendicular Gothic architecture, the rich tracery of a vault created by springing the stone ribs from their various points of support in such fashion that the effect is that of a spreading fan. There are finely developed examples in Henry VII's Chapel, Westminster Abbey, in St. Stephen's cloister at Westminster Hall, and in St. George's Chapel, Windsor. See Gothic Architecture.



**Fan-Tracery** seen in the vaulting of Henry VII's Chapel, Westminster Abbey, begun in 1503

**Farad.** The practical unit of electrical capacity, or capacitance. A condenser is said to have a capacity of 1 farad when a charge of 1 coulomb raises the potential difference between its plates by 1 volt. The farad being an excessively large unit for practical purposes—the capacitance of the earth itself is only about 1/1400 farad—the practical unit of  $10^{-6}$  farad, i.e. the micro-farad ( $\mu\text{F}$ ) is normally used. An even smaller unit, the micro-micro-farad ( $\mu\mu\text{F}$ ), or pico-farad, equal to  $10^{-12}$  farad, is the order of capacitance which is common to radio-frequency circuits. See Capacity.

**Faraday,** MICHAEL (1791–1867). British chemist and physicist. The son of a blacksmith, he was born at Newington Butts, London, Sept. 22, 1791. After a short apprenticeship with a book-binder, he became laboratory assistant to Sir Humphry Davy at the Royal Institution. There he quickly showed remarkable ability as an acute observer and original experimenter. In 1813–15 he travelled with Davy in Europe; ten years later he became director of the laboratory; and in 1833 Fullerenian professor of the Institution for life.

Faraday stands at the head of scientific observers of the 19th century, and his discoveries have left their indelible mark on the progress of mankind. Today his pointers to the paths of investigation in electricity are still being followed, and results are being obtained in accordance with his brilliant predictions. Faraday's



**Michael Faraday,**  
British physicist

earliest work under Davy was concerned with chlorine, two new combinations of which he discovered. He followed this up with the liquefaction of a number of gases, and the discovery of new kinds of optical glass. The later discovery was destined to lead to one of his most important investigations in electricity, that of magnetic rotatory polarisation in 1846.

Ten years of experimenting led Faraday on Aug. 29, 1831, to the greatest of his discoveries—the induction of electric currents. A disk of copper rotated between the poles of a horseshoe magnet; two rubbing contacts closed the circuit; and a galvanometer registered the continuous current. In 1833 he proved the identity of electricity from different sources; in 1834 came the discovery of equivalents in electro-chemical decomposition; in 1838 electrostatic induction, followed by the announcement of the relation between electric and magnetic forces. These results were given to the world in Nov., 1841, when Faraday read his first lecture on experimental researches to the Royal Society.

His second great period of discovery began in 1845 when he returned to the problem of the effect of a magnetic or electric field on transparent bodies. He soon announced the magnetisation of light and the theory of diamagnetism. This was the end of his original work, but he continued to publish *Experimental Researches in Electricity* up to 1855; *Experimental Researches in Chemistry and Physics* appeared in 1859.

In 1835 Faraday was given a pension, and in 1858 a house at Hampton Court, where he died Aug. 25, 1867. Deeply religious, a member of the sect known as the Sandemanians, Faraday rigidly separated his religion from his science. In the latter, he was one of the most brilliant experimenters ever known, and to him must be given the credit for the solid foundation of electrical science as it is known today.

**Bibliography.** The standard Life is by John Tyndall, 5th ed. 1894. Other Lives are by Bence Jones, 1870; J. H. Gladstone, 1872; S. P. Thompson, 1898; W. L. Randall, 1924; E. W. Ashcroft, 1931; T. Martin, 1935. A Tribute to Michael Faraday, R. Appleyard, 1931. Diary, ed. T. Martin, 4 vols., 1932–33.

**Faraday Building.** Post office building in Queen Victoria St., London. Completed in May, 1933, and named after Michael Faraday, it

houses the London trunk telephone exchange, the toll exchange, the continental telephone exchange, and the overseas radio telephone exchange. Each year it handles 55,000,000 London and provincial toll calls; 1,300,000 continental calls; and over 100,000 overseas radio telephone calls. The four exchanges employ 3,500 operators and a staff of 600 engineers. During the Second Great War, Faraday Building twice received direct hits from bombs and was several times damaged by blast, but at no time were communications interrupted.

**Faraday's Laws.** These laws of electrolysis discovered by Michael Faraday are as follows: (1) In an electrolytic cell the amount of an ion liberated or deposited at an electrode is proportional to the quantity of electricity (*i.e.* electric current  $\times$  time) which has passed in a given time; and (2) the masses of substances liberated or deposited by the same quantity of electricity are proportional to their chemical equivalents. These quantitative laws permit of the measurement of the average electric current flowing in a given time through a circuit containing an electrolyte. See *Current*; *Electrolysis*.

**Faraday Society.** Founded in 1903, to promote the study of electrochemistry, electrometallurgy, chemical physics, metallography, and kindred subjects. Among its presidents have been Sir Joseph Swan, Sir Robert Hadfield, and Sir Robert Robertson. The offices are at 6, Gray's Inn Square, London, W.C.1.

**Faradism.** Term used in electrotherapeutics describing an interrupted current of electricity. Faradism is helpful in diagnosing the nature and extent of paralysis and in the treatment of many muscular conditions.

**Farce** (Fr. from *Lat. farsire*, to stuff). Dramatic piece of an essentially ridiculous character to which extravagant language, caricature, and ludicrous situations may all contribute. The modern farce is more closely connected with the ludicrous element that came to be grafted on to early morality plays, and in time came to be given in separate performances. In its modern sense it has been succinctly defined as the briefer sort of comic play in which a more unrestricted licence of fun is allowed, and a stronger demand made upon the sense of probability. A critic has also said that whereas characters in comedy are larger

than life, farce deals with real people in unreal situations.

Modern farce may be said to have started with the plays of Samuel Foote, in the 18th century. In the 19th century the short farcical play as written by Poole, Maddison Morton, F. C. Burnand, and others was highly popular. A series of farces by Ben Travers, at the Aldwych Theatre, 1925–33, provided some of the best examples in the 20th century. The word originally meant an interpolation, like an actor's gag, hence a performance in which jests and humorous incidents predominated.

**Farcy** (*Lat. farcinium*). Disease affecting horses. It is a form of glanders (*q.v.*), and as such must be notified to the local authorities.

**Far East.** Term loosely applied to cover the countries of eastern Asia: Siam, Indo-China, China, Manchuria, Siberia, Japan, Malaya, and the East Indies.

**Far Eastern Region.** Asiatic territory of the R.S.F.S.R. This region of Siberia has an area of 900,731, sq. m. and extends from Vladivostok on the Pacific to the Bering straits, being bounded on the N. by the Arctic Ocean. The territory is rich in fur-bearing animals; timber constitutes one of its most important natural resources; and there are minerals and fisheries. In the Kamchatka area agriculture and cattle breeding have been developed, and there are three large state farms. Khabarovsk (pop. 199,364) is the principal city. The territory has a pop. of 1,593,400.

**Fareham.** Market town, seaport, and urban dist. of Hampshire, England. It stands on a creek off Portsmouth Harbour, 8 m. N.W. of Portsmouth and 76 m. S.W. of London, and is a railway junction. The chief building is S. Mary's Church, and near are the ruins of Porchester Castle. There is a trade in corn and coal. In medieval times Fareham was a prosperous port, but now it can be reached only by small vessels. Once a borough and a parliamentary division, it now shares an M.P. with Gosport. Market day, Mon. Pop. urb. dist. 40,000.

**Farewell.** Cape of Greenland, at its southernmost point, in lat. 59° 50' N. It is on a small island off the coast, with an alt. of 1,000 ft. The ice drifting past it from the N.E. towards Davis Strait, in addition to the currents, makes it dangerous for navigators.

**Far from the Madding Crowd.** Novel by Thomas Hardy, published 1874, one of his earliest

tales of rustic Wessex life. The central character is a woman farmer, Bathsheba Everdene, and the story tells of her tragic relations with three men. Gabriel Oak, in whose love she finds final repose, is a superb portrayal of fine and consistent loyalty.

**Fargo.** A city of N. Dakota, U.S.A., the co. seat of Cass co. The largest city in the state, it stands on the Red River of the North at the head of steamship navigation, 250 m. N.W. of Minneapolis, and is served by rlys. and an airport. Fargo and the surrounding area rest on the bed of the glacial Lake Agassiz, which is among the world's best wheat lands. Sweet clover has become an important crop here. Fargo is a distributing point for farm machinery and cars. It has meat packing plants and manufactures glass, wood, and steel products. Here is the state agricultural college. The town was settled in 1871 and incorporated four years later. Nearly half the pop. of 32,580 claims Norwegian descent.

**Farida** (b. 1920). Former queen of Farouk I of Egypt. Daughter of Youssuf Zulfikar, a judge, and granddaughter of Said Mohammed, former prime minister, she married the King Jan. 20, 1938. He announced his divorce of her as from Nov. 17, 1948.

**Faridkot.** Former state of India, now part of the Patiala and E. Punjab Union. In the S. of Ferozepore district, its area is 643 sq. m. The ruling family belonged to the Sidhu-Barar clan of the Jats, and was founded in the 16th century. Pop. 199,282.

**Faridpur.** District and town of E. Bengal, Pakistan, in Dacca division. The name is derived from a Mahomedan saint, Farid Shah, whose shrine has been set up in the town. The latter is on the right bank of the Ganges and is connected by rly. with Calcutta. Of the total area of the district, 2,821 sq. m., more than three-quarters is under cultivation. This swampy district grows much rice. Other crops are jute, which is the chief export, and pulses. Hand weaving is the principal industry. Pop. dist., 2,888,803; town, 17,450.

**Faridun.** Hero of Persian mythology. His story is told in the *Shāh-Nāmah* of Firdusi (Eng. trans. A. Rogers, 1907). Faridun overcomes the dragon tyrant Zuhak and occupies the throne. He is said to have reigned justly for 500 years, and to have gone about the world doing good and planting cypresses and roses.

**Farina** (Lat., meal). Starchy preparation used for food or in the industrial arts. The food-products of cereal grains and pulses, and starchy stems, roots, and tubers, are collectively called farinaceous. Farina is defined under the U.S. Federal Food, Drug, and Cosmetic Act, 1938, as a wheat food product representing closely ground endosperm particles, sufficiently freed from bran and germ to give an ash content not exceeding 0.6 p.c. on a dry weather basis.

The farina used for sizing cotton textiles is principally potato starch, comprising normally starch 82.70 p.c., cellulose and ash 0.58 p.c., and water 16.72 p.c. It yields a thicker paste, and owing to its sparse nitrogenous matter is less liable to mildew than any other starch. It is mixed with wheat flour and china clay for stiffening fabrics, and because of its purity is the chief source of dextrin. Fossil farina or rock-meal is a white crumbly form of calcium carbonate.

**Farinelli** (1705-82). Professional name of the Italian singer Carlo Broschi. Born at Naples, Jan. 24,



Farinelli, Italian male soprano  
From an engraving

1705, Broschi was a pupil of Porpora, in whose opera, *Eumene*, he made his first appearance in 1722. This made him famous, and procured him lucrative engagements in Vienna and London. In 1736 he went to Madrid and became a favourite of Philip V. There he remained for 25 years, being loaded with honours and exercising almost regal powers. His last years were passed at Bologna, and he died July 15, 1782. The exceptional beauty and range of Farinelli's voice and his wonderful control over it made him one of the most remarkable male sopranos who have ever lived.

**Faringdon.** Market town of Berkshire, England, known also as Great Faringdon. It is 17 m. S.W. of Oxford, and has a railway station. All Saints Church is a large building with brasses and other memorials; other buildings are the market hall and Faringdon House. The agricultural centre for a large district, Faringdon has a trade in corn, cattle, etc. Market day, Tues. Pop. 3,009.

**Faringdon, ALEXANDER HENDERSON, 1ST BARON** (1850-1934). British business man and poli-

tician. He was born in London, Sept. 28, 1850, became a stock-broker, and in time was head of the firm of Greenwood & Co. Having joined the board of the Great Central rly. in 1894, he became chairman in 1899, and deputy chairman of the L.N.E.R. in 1922. In 1898 he was returned to parliament as Unionist M.P. for West Staffordshire, but lost his seat in 1906. During 1913-16 Henderson was M.P. for St. George's, Westminster. In 1902 he was made a baronet and in 1916 a baron. On his death, March 17, 1934, the title passed to a grandson, Alexander (b. 1902).

**Farington, JOSEPH** (1747-1821). A British painter and diarist. Son of a clergyman, he was born at Leigh, Lancs, Nov. 21, 1747, and became a pupil of Richard Wilson. Elected R.A. in 1785, he is best known for two collections of engraved views of English lakes, published in 1789 and 1816 respectively. Farington was one of the first to recognize Constable's originality. He died at Didsbury, Dec. 30, 1821.

In 1921 the discovery of a diary (1793-1821) and note-books promoted him to fellowship with such diarists as Pepys and Evelyn. It was purchased and made public by *The Morning Post*, and, edited by J. Greig, was published in 8 vols., 1922-28.

**Farini, LUIGI CARLO** (1812-66). Italian statesman. Born at Russi, near Ravenna, Oct. 22, 1812, he



Luigi Farini, Italian statesman

early became an ardent nationalist, and in 1843 was banished from the papal states. On the election of Pius IX in 1846 he returned to Rome as secretary to the ministry of the interior, and later was appointed to the department of public health. On the declaration of the Roman republic, 1849, he resigned, but, disappointed at the trend of Pius's policy, Farini went to Turin, and wrote in 1851 his famous *Lo Stato Romano dal 1815 al 1850*. The same year he became minister of public instruction and an ardent supporter of Cavour, creating a deep impression by his letters to Gladstone on Italian problems. In 1859 Farini was sent as Piedmontese commissioner to Modena, became dictator of the duchy, and negotiated the transfer of Modena, Parma, and Tuscany to



Piedmont Appointed minister of the interior 1860 he became premier of the new kingdom of Italy 1861-63 and died Aug 1, 1866

**Farjeon** Name of a family of British writers and musicians Benjamin Leopold Farjeon (1838 1903) journalist and novelist, was born in London of Jewish descent He emigrated and founded at Dunedin in 1861 the first newspaper published in New Zealand Returning to London he published *Grif*, 1870 his later novels, popular in their day dealt chiefly with mysteries and detection of crime He died July 23, 1903 He married Margaret (1853-1933) daughter of the American character actor, Joseph Jefferson, and descendant of the US president, Thomas Jefferson Of their four children

Harry (1878-1948), born May 6, 1878, studied at the R.A.M., at which he became professor of harmony and composition, 1903 His compositions included a piano concerto, symphony in D, idyll for oboe and orchestra, symphonic poem, *Summer Vision*, choral works and songs He died Dec 29, 1948

Eleanor, born Feb 13, 1881 made her reputation with light verse *Nursery Rhymes of London Town* established her as a writer of whimsical imagination and originality Martin Pippin in the *Apple Orchard* was one of the most popular of her fantasies, and in her autobiographical *A Nursery in the Nineties*, 1935, she gave an intimate picture of the early life of herself and her brothers

Joseph Jefferson, born June 4, 1833 wrote successful crime novels

and plays His thrillers, *No 17* and *The Green Dragon*, were dramatised, and his later books included *Underground*, *The Z Murders* *Tiunk Call* A number of his stories and serials were broadcast

Herbert (1887-1945) was born March 5, 1887 As journalist and dramatic critic he wrote for the *Daily Herald*, 1919-23, the *Daily Express*, 1923, *Vogue* 1921-23, and 1927-35 As a dramatist he first achieved fame with *Advertising* April, 1923, and, in collaboration with his sister Eleanor, wrote revues and light operettas, notable for their wit and delicate satire *The Two Bouquets*, 1936, *Nine Sharp*, 1938, *An Elephant in Arcady*, 1939, *Light and Shade*, 1943 He presented a series of intimate revues (*The Little Revues*) at the Little Theatre, London 1938-42 He died May 3, 1945

**Farley, JOHN MURPHY** (1842-1918) Irish American prelate Born at Newton Hamilton, co Armagh, April 20, 1842, he was educated in Monaghan, New York, and Rome Ordained priest in 1870, he was assistant pastor of St Peter's New Brighton, Staten Island 1870-72, secretary to Archbishop McCloskey 1872-84, private chamberlain to Leo XIII 1884 vicar general, New York diocese 1891, and domestic prelate to Leo XIII, 1892 Consecrated auxiliary bishop of New York, 1895 he became archbishop of New York, 1902, was made a cardinal, 1911, and died Sept 17, 1918 He wrote *A Life of Cardinal McCloskey* 1900

efficiency increases with decreasing size of holding, and that there is an increase in output for market in spite of greater home consumption This is due, at least in part, to the fact that labour per acre decreases as the size of holding increases Capital invested in buildings per acre also decreases with size of holding

In some countries and districts the farm buildings and dwelling houses are grouped together in hamlets or villages, and both live stock and machinery have to be taken out to the land which surrounds them More commonly the buildings of a farm are isolated in the centre of the holding

#### Different Types of Farms

The following are the chief kinds of farm to be found throughout the world (1) general or mixed, (2) dairy, (3) purely arable, (4) horticultural (5) specialist (6) ranch cattle, or sheep station (7) hill sheep

Family farms everywhere are usually general or mixed farms Much of the food consumed by the livestock is grown on the holding while their manure returned to the land, helps to fertilise it, the mixed farm thus being the best means of keeping the land fertile Current tendencies are, however towards specialisation, and the farmer running a mixed farm unless it is large enough to allow of specialist managers for its different branches, may fail, since he cannot well be a specialist in all branches

The dairy farm is generally a special type of the mixed farm in which livestock is restricted to dairy cattle Such a farm flourishes particularly if within easy reach of a large centre of population Purely arable farms are to be found chiefly away from cities, and are often devoted to monoculture In the past, it has not been uncommon for a farmer to crop virgin land continuously for several years without manuring and then, when its fertility has been seriously reduced, pass on to fresh virgin land As the extent of virgin land decreases, and settlement increases, treatment with so called artificial fertilisers, or other forms of manure, becomes essential

Fruit, vegetables, flowers, and such special crops as rhubarb, watercress, herbs, etc., are the principal products of horticultural farms It is sometimes difficult to differentiate between a farm and a market garden, but the horticultural farm proper has some live stock, and its crops, with the exception of trees, are grown in a

## FARM: TYPES AND PRODUCTS

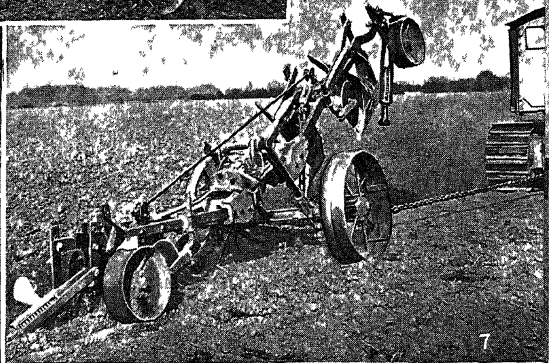
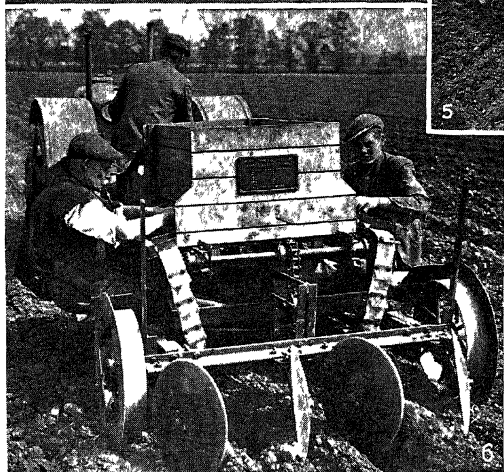
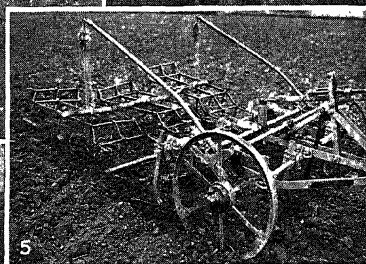
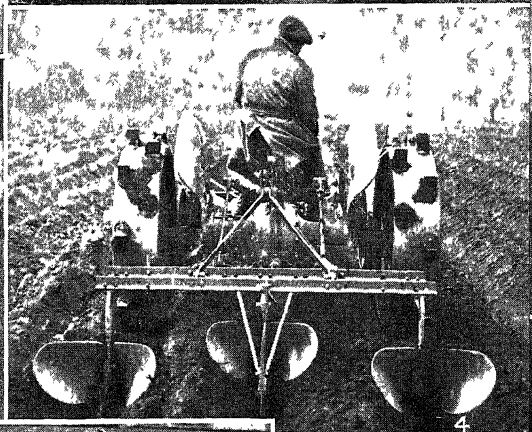
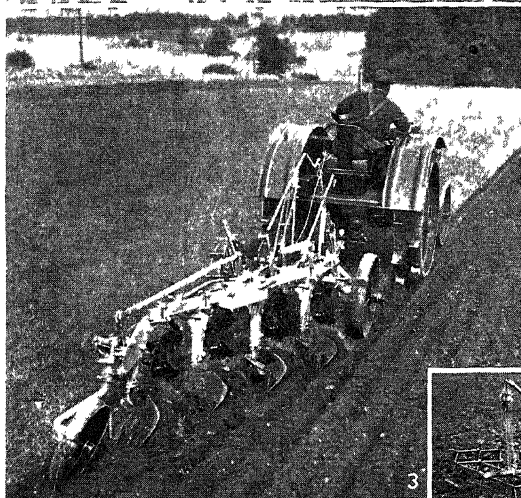
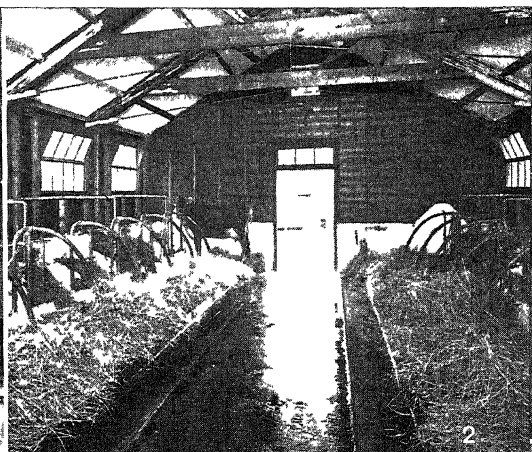
R. W. Haddon Managing Editor *Farmer & Stockbreeder*

*Farm is a term covering a unit producing a wide variety of materials but based always upon the land and its fertility See also Agriculture Crops Monoculture Rotation of Crops etc*

The farm is most simply defined as the unit of organized production from the land, whether the produce takes the form of crops for direct human consumption, of animal products, or of vegetable fibre for clothing and other purposes It had its beginnings with the first development of settled human communities The size and nature of the unit vary widely both according to the type of production concerned and the political structure within which land is held The small holding of the Chinese or Indian peasant may be no more than an acre, while the ranches of America may extend up to 20 000 acres, and sheep and cattle stations in Australia up to

30,000 acres In Soviet Russia, the large state farms average about 40 000 acres (see *Sovkhoz*) the collective farms about 1,200 acres (see *Kolkhoz*) The large arable estates of 1,000 acres upwards usual in central Europe up to the Second Great War were for the most part broken up immediately after it e.g. in Hungary, where in 1938 thirty six magnates owned over a million acres and the 1,200,000 peasants 950,000 acres between them, a decree of 1945 limited peasants' estates to 250 acres, others to 140

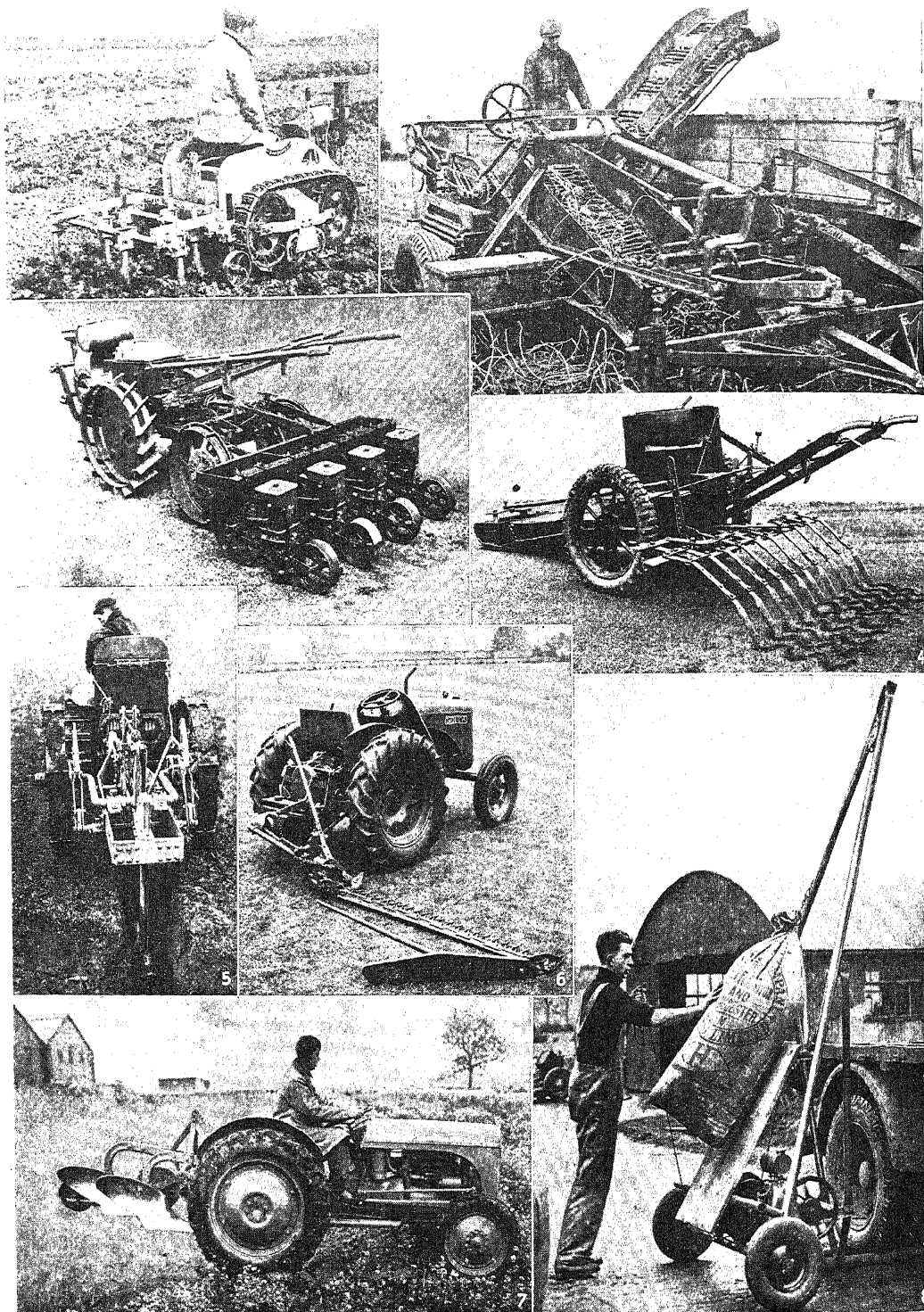
The majority of farms throughout the world are from 3 to 500 acres It is generally accepted that, down to 10 acres, economic



1 Farm building at Ampthill Bedfordshire 2 Cattle shed with concrete floor and tubular stalls 3 Four furrow tractor drawn plough 4 Splitting back ridges in preparation for potato planting 5 Drag harrow with automatic lift attachment 6 Potato planting machine which sows and covers two rows of potatoes at one time 7 Two furrow one way plough constructed to plough 12 ins deep and to subsoil 6 ins

# FARM MODERN FARM BUILDINGS AND MECHANICAL CULTIVATORS

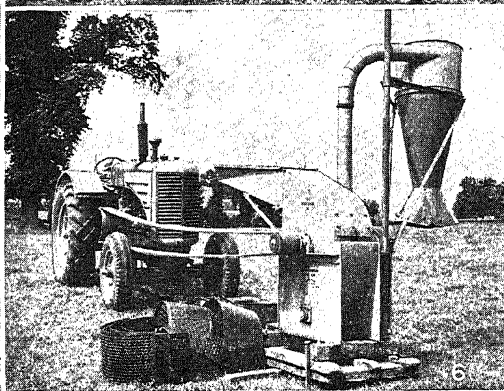
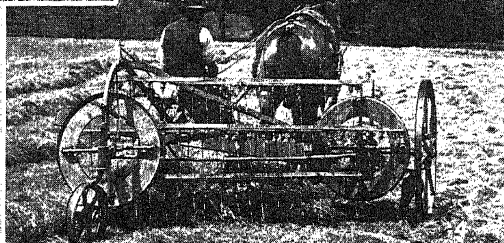
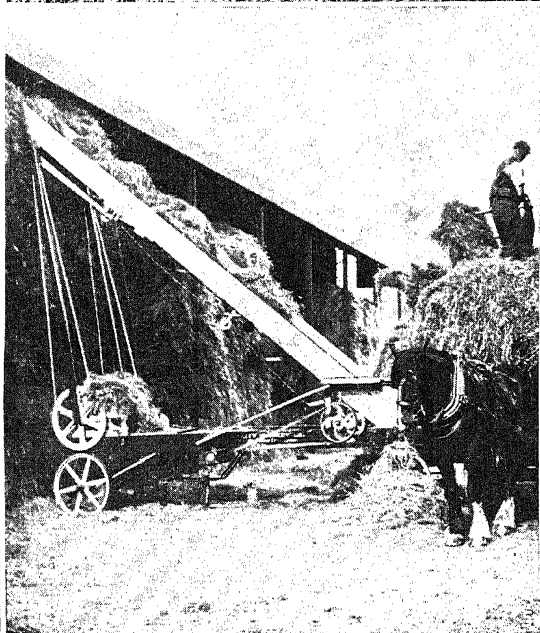
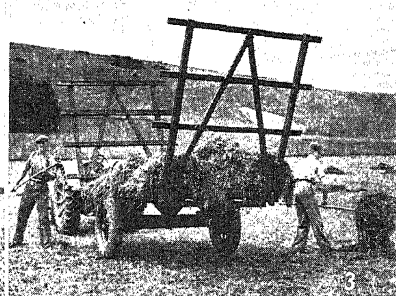
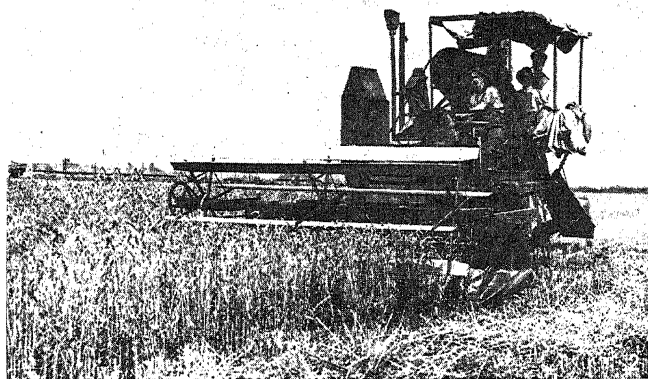
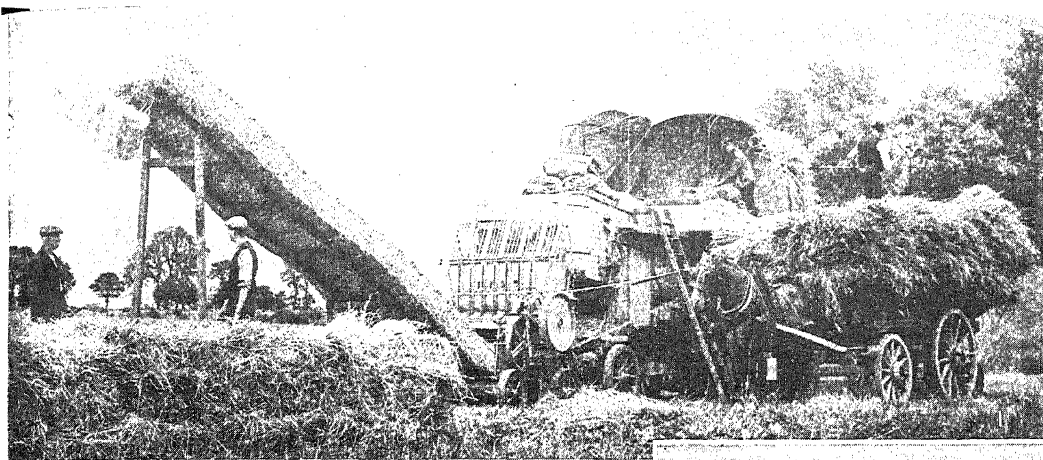
Photos 2 3 5 and 7 Farmer and Stockbreeder



1. Motor-driven garden cultivator. 2. Potato lifting machine, with endless chain drive and conveyor belt. 3. Battery of seed drills attached to a tractor. 4. Power-driven harrow, showing the zig-zag action of the tines. 5. Drainer (tractor-attached) cutting a trench. 6. Tractor-mounted mowing machine, with power-operated cutter bar. 7. Combined tractor and plough, the blades lifted by finger-tip control. 8. Sack lorry-loader powered by small petrol engine

# **FARM: POWER-DRIVEN IMPLEMENTS TO AID THE FARMER**

*Photos 1 and 5, Farmer and Stockbreeder*



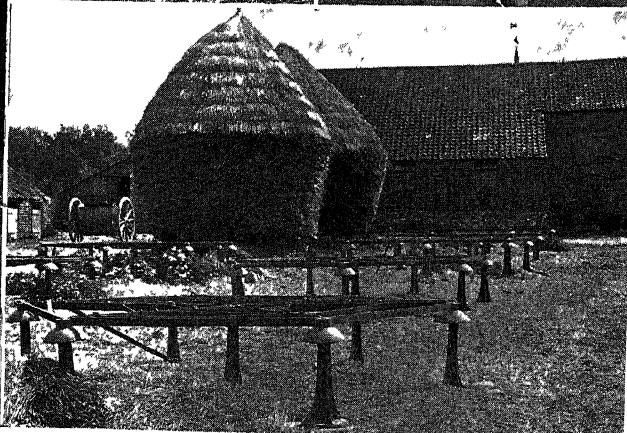
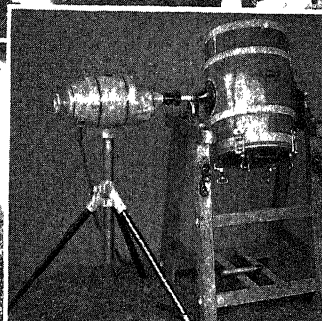
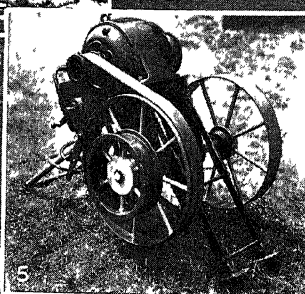
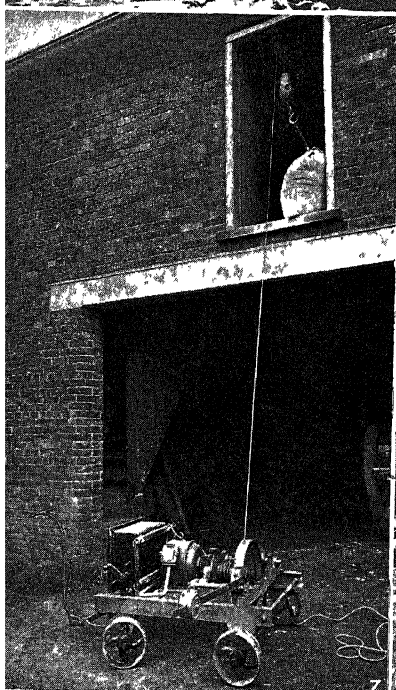
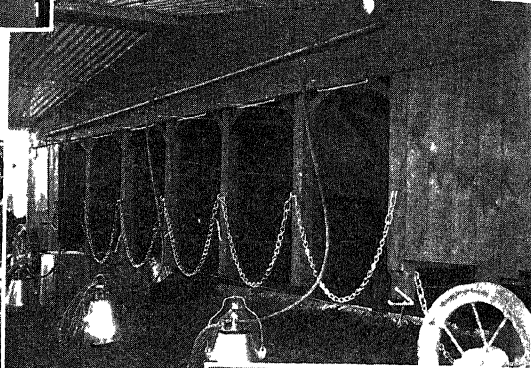
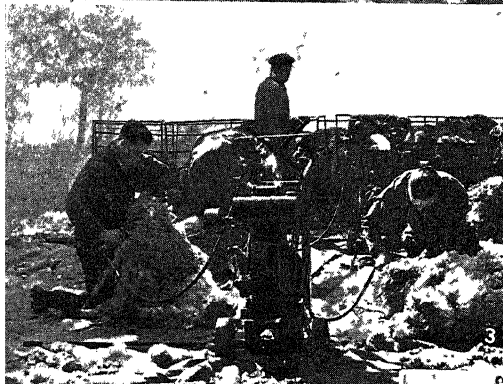
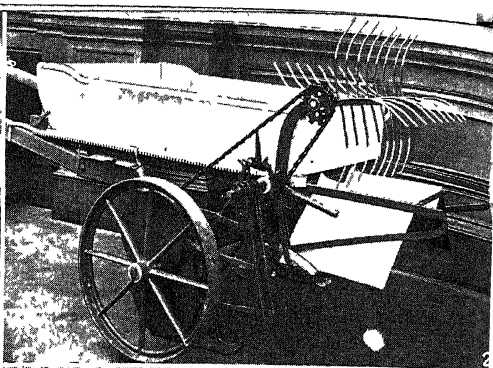
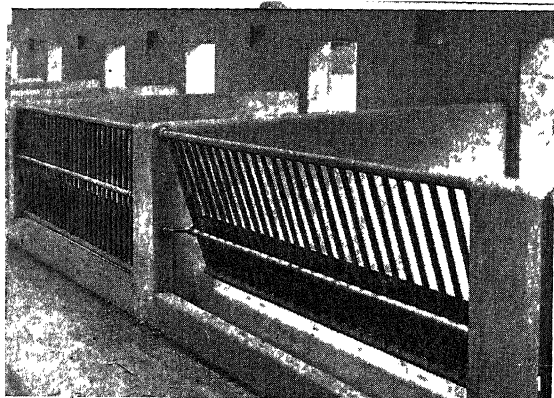
1. Combine machine, threshing corn, and trussing and delivering straw to a stack, in one operation. 2. Self-propelled combine harvester, cutting and threshing grain. 3. Loading lucerne on to light two-wheeled trailer drawn by tractor.

4. Hay tedder at work, gathering and spacing the hay ready for loading. 5. Stacking straw into a Dutch barn with a petrol-driven elevator. 6. Hammer mill in which a series of small revolving hammers takes the place of rollers

#### FARM: SPEEDY AND EFFICIENT METHODS OF FIELD HARVESTING

*Photo 5, Farmer and Stockbreeder*





1. Pig pens, with swing panel giving ease of access to feeding trough. 2. Manure spreading machine. 3. Power-driven clippers for sheep shearing. 4. Field milking bail, with mechanical milking and recorder attachment. 5. Multi-

purpose electric motor drive. 6. Portable electric motor operating a milk churn. 7. Mobile electric motor used for barn loading. 8. Iron rick stands which raise the base of a stack three feet clear of the ground.

# **FARM: FITTINGS AND MACHINERY OF THE FARMYARD**

*Photos 2 and 7, Farmer and Stockbreeder*

rotation with farm crops (*see* Rotation of Crops).

Specialist farms concentrate in the main on one crop or stock; many of them are associated with pig and poultry rearing. Hill sheep farms are typical of the mountainous districts of Scotland, Wales, and the ~~high~~ of England.

Ranches, estancias, and cattle and sheep stations are found in the open, uncultivated spaces of N. and S. America and of Australia.

The farm has tended to retain its identity as a unit over long periods, and the farm buildings of the past have often been of very solid construction, unsuitable for adaptation to changing technical developments. New buildings are, however, frequently constructed on simple lines which make rapid adaptation to new requirements easy. Developments in transport, and in the use of machinery to do work previously done by human labour, have also influenced the construction of farm buildings.

The transmission of electricity to the farm has probably effected the most revolutionary change in its economy. While in Denmark very few, even of the smallest holdings, are without main electricity, in England and Wales of the 290,600 farm units covered by the national farm survey of 1941-43, only 77,400 were connected to a public supply, more than half for light alone; 8,700 had a private supply. The cost of installation and upkeep of wiring to carry a comparatively small load, rather than lack of appreciation of the value of electricity to the farmer, hinders its wider application in Great Britain. Electricity probably has most to offer to the dairy farmer in the form of power for milking machines, cooling plant, washing and sterilising of apparatus but it has many uses in general and poultry farms, as well as in horticulture, for *e.g.*, crop drying, grain sprouting, electro-silage, electroculture, beehive heating, ultra-violet irradiation, electric fences, temperature control in storage places.

**Bibliography.** Farm Economics, etc., F. App. 1929; The Profitable Small Farm, E. Graham, 1930; Change in the Farm, T. Hennell, 1934; Problems of the Countryside C. S. Orwin, 1945.

**Farman, HENRI** (b. 1874). French aviator and aircraft designer. Son of an English journalist, he was born in Paris May 26, 1874. He became a racing cyclist and later founded a factory for the production of cycles and motor cars. He took up aero-

nautics in 1907 and flew the first Farman aircraft, a biplane, at Issy-les-Moulineaux. In 1908 he established a flying school and aircraft works at Buc, near Versailles, and a year later at Reims became the first pilot to fly a circuit of 100 miles.

In 1910 Henri Farman's brother Maurice founded an aircraft factory, and in 1912 the two combined their resources to erect a new factory at Billancourt. They specialised in the construction of military biplanes and supplied large numbers to the British and French governments, notably the Maurice Farman "Longhorn" and "Shorthorn." The Farmans originated the pusher type of air-screw, and spent several years developing a stratosphere aeroplane with pressurised cabin.

**Farmer.** One who farms land, an agriculturist. Originally the word had a different meaning, referring to one who collected the taxes by contract. The farmer collected as much as he could, but paid over a fixed sum, called the *firma*, to the king. There was a system of this kind in Rome; it was followed by the sheriffs in medieval England. The word was used later for one who took over a piece of land, paying a fixed sum for the right to cultivate it. *See* Agriculture; Farm.

**Farmer, JOHN** (1835-1901). A British musician. Born at Nottingham, Aug. 16, 1835, he studied music at Leipzig and Coburg, and afterwards taught it at Zürich. In 1862 he settled at Harrow, and in 1864 was made music master. From 1885 until his death on July 17, 1901, he was organist of Balliol College, Oxford, where he arranged Sunday even-



John Farmer,  
British musician  
*Elliot & Fry*

organist of Balliol College, Oxford, where he arranged Sunday evening concerts and founded the Musical Society. In addition to his song tunes, Farmer wrote oratorios and edited volumes of songs for soldiers and sailors, and for children.

**Farmer, SIR JOHN BRETLAND** (1865-1944). British botanist. Born at Ather-

stone, April 5, 1865, and educated at Magdalen College, Oxford, he was demonstrator in botany to the university, 1887. In 1892 he became assistant professor of biology at the imperial college of science, S. Kensington. In 1895 his chair was made independent. During 1907-29 he was professor of botany and director of the biological laboratories there. He organized the Forest Products Research Board; and he helped to found a college of tropical agriculture in Trinidad. Knighted in 1926, an F.R.S. and royal medalist, Farmer died Jan. 26, 1944.

**Farmer-General.** Member of a financial organization in France under the monarchy, who, in consideration of payment of an agreed sum to the government, secured the privilege of collecting taxes. The system, based upon that of the Roman publicans (*q.v.*), seems to have been in existence in France in the 14th century and was firmly established in the 16th. Following the Revolution the farmers-general were abolished.

**Farmers' Club.** London club founded in 1842, for those interested in agriculture. It is housed at 2, Whitehall Court, S.W. The term is also often applied to the co-operative trading societies formed under the auspices of the Agricultural Organization Societies of England, Scotland, and Ireland. *See* Agriculture.

**Farmer's Wife, THE.** Comedy of Devon country life by Eden Phillpotts. Produced at the Court Theatre, London, March 11, 1924, it ran for 1,329 performances, and made the reputation of Sir Cedric Hardwicke, who appeared as Churdles Ash. It was revived in 1928 and 1932.

**Farnborough.** Urban dist. and parish of Hampshire, England. It is 33 m. S.W. of London, with a rly. station. A mausoleum attached to S. Michael's Roman Catholic church, built by the Empress Eugénie, contains the remains of Napoleon III, the Prince Imperial, and the empress herself, who for many years lived at Farnborough Hill. Farnborough is within the Aldershot military area and contains North camp, also a Government air research station founded as the Royal Aircraft

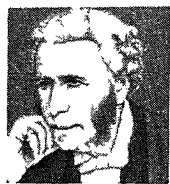


Farnborough. Mausoleum in which Napoleon III, the Empress Eugénie, and the Prince Imperial are buried



Factory in 1912, and concerned with the production and testing of new airframes, engines, and instruments. This has a vertical wind tunnel for studying the causes of spinning, and the Queen Bee (*q.v.*) target aircraft was developed there. The Royal Aircraft Establishment is staffed with R.A.F. officers for flying duties and civilian scientists for technical work. Pop. of urban dist., 24,000. Another Farnborough is a village in Kent, 4 m. S.E. of Bromley, and others are in Berkshire and Warwickshire.

**Farnborough**, THOMAS ERSKINE MAY, BARON (1815-86). British historian. Born in London



T. Erskine May, Baron Farnborough

on Feb. 8, 1815, he was educated at the Bedford grammar school. In 1831 he became an assistant in the library of the house of commons, and in 1833 was called to the bar. In 1846 he was made an examiner of private bills; in 1847 a taxing master; and in 1856 a clerk assistant to the house. In 1871 he was appointed clerk of the house of commons, and he retired in April, 1886, dying in London on May 17. He had been made a peer a few days before his death, but left no heir. Erskine May's long association with the house of commons, together with his aptitude for research, made him the chief authority on its procedure. He wrote a Treatise on the Law, Privileges, Proceedings, and Usage of Parliament, 1844; and devoted himself to the constitutional history of England, and his work dealing with the period 1760-1860, published 1861-63, remains the standard authority.

**Farne**, FEARNE, OR FERN ISLANDS, OR THE STAPLES. Group of seventeen rocky islets and rocks off the coast of Northumberland, England, separated from the mainland by the Fairway Channel. Farne or House, the largest (16 acres), was the retreat of S. Cuthbert (*q.v.*) in the 7th century, and Longstone with its lighthouse is famous for its association with Grace Darling (*q.v.*).

**Farnell**, LEWIS RICHARD (1856-1934). English scholar. He was born at Salisbury Jan. 19, 1856. As fellow of

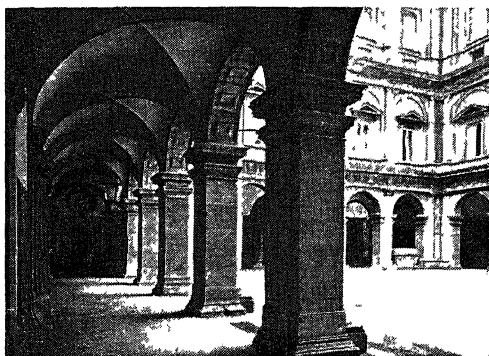
Exeter College, Oxford, he studied classical architecture in Germany, Greece, and Asia Minor. He was rector of his college 1913-28 and vice-chancellor of the university 1920-23. He died March 29, 1934. The leading authority of his day on Greek religion, Farnell published *The Cults of the Greek States*, 1896-1909; *Hero-Cult*, 1921; *Outline of the History of Greek Religion*, 1921; and his reminiscences, *An Oxonian Looks Back*, appeared posthumously.

**Farnese**. Name of the Italian ducal family of Parma during the 16th and 17th centuries. First appearing in history as lords of Farnete, in Tuscany, in the 12th century, they became prominent by the election as pope Paul III of Alessandro Farnese, 1534, brother of Giulia, favourite of pope Alexander VI. In 1545 Paul gave the duchy of Parma to his natural son Pierluigi (1503-47), a notorious libertine, murdered by partisans of Charles V at Piacenza. Of Pierluigi's sons, Alessandro (1520-89) became a cardinal in 1534, and completed the Farnese Palace (*v.i.*) in Rome, while Ottavio (1521-86), after a long struggle with his grandfather the pope, became 2nd duke of Parma in 1551, recovering Piacenza a few years later. His son Alessandro was the famous soldier in Spanish service, better known as the 3rd duke of Parma (*q.v.*).

Elizabeth Farnese (1692-1766) was the last notable member of the family. The daughter of Odoardo Farnese, she married in 1714 Philip V of Spain, whose weakness, and later insanity, left her the

virtual ruler of Spain during his nominal reign. With Cardinal Alberoni she worked for the restoration of Spanish rule in the lost Italian provinces, a scheme broken only by the demands of the Quadruple Alliance in Jan., 1720. The Farnese succession ended with Antonio (1679-1731). Consult Elizabeth Farnese, E. Armstrong, 1892.

**Farnese Palace**. Building in Rome, one of the finest examples of later Renaissance architecture. It was designed and begun in 1530 by Antonio da Sangallo, and the work was carried on and completed by Michelangelo, Vignola, and Giacomo della Porta. The length of the front façade is 190 ft., and the building is 260 ft. deep and 97 ft. high to the top of the cornice. The latter, the most striking feature, was added by Michelangelo, who was also responsible for the upper



Farnese Palace, Rome. Arcade of the courtyard, a magnificent example of the architectural work of Michelangelo

storey which it crowns. The courtyard on the S. side is surrounded by arcades, modelled on those of the Colosseum. The building was commissioned by Cardinal Alessandro Farnese, later Pope Paul III, and remained in the possession of the Farnese family until the latter became extinct in the 18th century. It then passed, with the Villa Farnesina, to the king of Naples.

**Farnham**. Market town and urban district of Surrey, England. It stands on the river Wey, 38 m. S.W. of London, and has a railway station. The centre of a district in which hops are grown, it has trade therein and in other agricultural produce, which it has developed partly owing to its proximity to Aldershot. S. Andrew's church is a noble Transitional edifice, and other buildings include the town hall, an old grammar school, and Georgian houses.

Above the town stands the castle, residence of the bishop of Guild-



Farne. S. Cuthbert's church, Inner Farne, on the site of the hermitage where the saint died in 687  
Valentine

ford. The first castle was built in the 12th century, but this and also its successor were destroyed. The present building dates mainly from the 17th century. Near the town are Moor Park, the residence of Sir W. Temple, where for a time Swift lived, and the ruins of Waverley Abbey, the earliest English Cistercian house. Farnham belonged to the bishop of Winchester before 1066, and one of the bishops made it a chartered town. Having decayed, it ceased to be a borough in 1789. Here Cobbett was born, his birthplace being now an inn, The Jolly Farmer. Caesar's Camp, 2 m. N., dates from the Iron age. Market day, Mon. Pop. 23,000. Other places called Farnham are in Bucks, Dorset, and Suffolk.

**Farnham.** Town of Quebec, Canada. It is on Yamaska river, in Missisquoi co., 40 m. E.S.E. of Montreal, and is served by C.N.R. and C.P.R. With a government experimental tobacco farm, it is the centre of a tobacco growing region, and has sawmills and butter and cheese factories. Pop. 4,258.

**Farnol,** (JOHN) JEFFREY (b. 1878). British novelist. Born Feb. 10, 1878, and educated at a private school, he began writing while in his teens. In 1902 he went to America, where he painted theatrical scenery, and published his first volume, *My Lady Caprice*, 1907 (later reissued as *Chronicles of the Imp*). In 1910 he returned to England, and with *The Broad Highway* achieved popularity as a writer of healthy sentimental adventurous romance, with a special interest in pugilism. Later stories included *The Amateur Gentleman*, 1913; *Beltane the Smith*, 1915; *Black Bartlemy's Treasure*, 1920; *The Quest of Youth*, 1927; *The Jade of Destiny*, 1931; *The Way Beyond*, 1933; *Murder by Nail*, 1942.

**Farnworth.** Borough of Lancashire, England, 3 m. S.E. of Bolton, of which it is practically a suburb. It has three railway stations, and a tramway service. Sharing in the industries of Bolton, it has spinning mills, engineering works, and machinery shops, while around are coal mines. S. John's is the principal church. The council owns markets, baths, cemetery, sewage works, town hall, library, and parks and recreation grounds. Water is supplied from Bolton. Farnworth gives its name to a parliamentary division of Lancashire. Market days, Mon. and Sat. Pop. approx. 26,000.

**Faro.** Gambling card game. It is one of the oldest of banking games, supposed to be of Italian origin,

and under the name of Pharaoh was very popular in the time of Louis XIV. It requires costly apparatus and a lay-out. A full pack of 52 cards is put into a dealing box with an open top, one card being released at a time. The first card in sight at the beginning of each deal is called *soda* and the last card left in the box is *in hoc*. The dealer or banker withdraws *soda* and places it some little distance away; the next card, termed *the loser*, he lays by the side of the box. The third card taken out is *the winner*, which he places on the *soda*; thus, each alternate card is a winner or loser, eventually forming two separate piles, with *soda* and *loser* for foundation. The object of the players is to forecast correctly (indicated by the way in which they stake their money upon the lay-out) which particular card of any suit will win or lose.

**Faro.** Administrative dist. of S. Portugal, coextensive with the prov. of Algarve. The climate is genial and the soil fertile, producing olives, dates, almonds, figs, and cereals. Area 1,937 sq. m. Pop. 317,628.

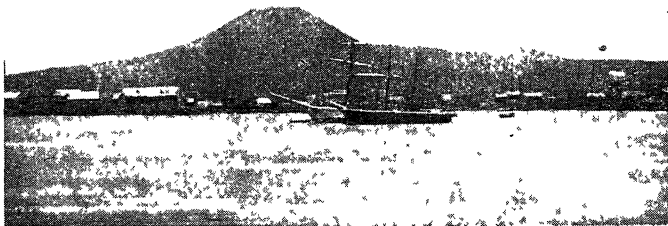
**Faro.** Seaport and city of Portugal, capital of Algarve prov., and an episcopal see. It stands on the Atlantic, at the mouth of the Rio Feroso, 20 m. S.W. of Tavira, and is the terminus of the Lisbon-Faro rly. Its harbour is large and sheltered, but shallow and tidal. The town possesses a cathedral, a military hospital, a museum, and a ruined Moorish castle. Its large public square is the centre of the life of the city. It exports fruit, vegetables, wine, cork, sumach, sardines, anchovies, tunny, and baskets. Faro was taken from the Moors by Alphonso III of Portugal, burned by the English in 1596, and almost destroyed by an earthquake in 1755. Pop. 19,695.

**Faroe Islands** (Dan. *Färøerne*, sheep island). Group of islands in the N. Atlantic, belonging to Denmark. The group lies about 195 m. N.W. of the Shetlands, and 250 m. S.E. of Iceland. There are 21

islands, 17 of them inhabited. Of volcanic and basaltic formation, they are mountainous, rising in Slátarretinde in the island of Ostero to 2,890 ft., with lofty and steep cliffs and deep fjords, and separated from each other by swift and dangerous currents. The rainfall is heavy, and storms are frequent. Lying between lat. 61° 20' and 62° 20' N., not a great distance from the Arctic Circle, the islands are mild but moist, and the harbours are seldom frozen. There are no trees, and barley is the only cereal grown: turnips and potatoes thrive, coal and peat are found.

The chief industries are sheep raising, cattle breeding, wild-fowling, whaling, and fishing. Sheep, fish (wet and dried), wool, feathers, skins, tallow, butter, and fish-oil are exported. The largest island is Strömö, with the capital, Thorshavn; Suderö is the next largest. There are cathedral ruins in Kirkubö on Strömö. Colonised by the Norwegians in the 9th century, the Faroes became Danish in 1380. The people still speak an old Norse dialect. They have a local parliament which in 1948 was granted complete autonomy by Denmark. In religion the Faroese are mostly Lutheran. The chief magistrates of the islands are an amtman, who is also a military commandant, and a land-vogt, who is the chief of the police.

After the German invasion of Denmark in 1940, the Faroes were occupied by Great Britain to prevent their becoming a base for enemy operations against Allied shipping. A force of Royal Marines landed at Thorshavn without opposition on April 13, 1940. A radio station and aerodrome were laid out there, and R.A.F. flying-boats operating from the Faroes did invaluable work escorting convoys and hunting submarines. The British bases on the islands helped to prevent blockade running to the Norwegian coast. The islands retained their own internal administration, and at the end of the war the British garrison was withdrawn. Area 540 sq. m. Pop. 25,744.



Faroe Is. Klaksvig, the principal town on Bórðo Island, and Klaksvig Mountain

**Farouk I** (b. 1920). King of Egypt. Son of Fuad I and Queen Nazli, he was born in Cairo, Feb. 11, 1920, and spent his childhood in Naples and Rome. Created Emir es Said, or prince of Upper Egypt, in 1933, he lived in England 1935-36, when he studied for the R.M.A., Woolwich. Recalled to Egypt on the death of his father, April 28, 1936, he attained his majority at the age of 18 lunar years, and was invested as king in parliament on July 29, 1937. Until then the royal powers were exercised by a council of three regents. Farouk married Farida Zulfikar, 1938, divorcing her 1948, and had three daughters: Princess Ferial (b. 1938); Princess Fawzieh (b. 1940); and Princess Fadia (b. 1943). For the events of his reign, see Egypt, History.

**Farquhar, GEORGE** (1678-1707). Irish dramatist. Born in Londonderry and educated at Trinity College, Dublin, he started life as an actor in Dublin, but obtained a commission in the army, 1702. His first play was *Love and a Bottle*, 1699, which was followed by *The Constant Couple*, 1700; and *Sir Harry Wildair*, 1701. His most notable production was *The Beaux' Stratagem*, 1707, two characters in which, Lady Bountiful and Boniface, the innkeeper, have passed into the language as types. The *Recruiting Officer*, 1706, contains the song *Over the Hills and Far Away*. Farquhar died in pecuniary difficulties. He had sold his commission to marry a professed heiress, who turned out penniless. Farquhar magnanimously forgave her. His large-heartedness is reflected in his comedies which, not perhaps so witty as those of Congreve, are pervaded by a sympathy that gives reality to plot and characters. His complete works, ed. C. Stonehill, were issued 1930.

**Farr, THOMAS GEORGE** (b. 1914). Welsh boxer. A native of Tonypandy, Glam., he worked as a youth in the coal mines, but sought

a new career as a professional boxer. From the humblest beginnings, he became British heavyweight champion on March 15, 1937, defeating Ben Foord, and in Aug. went the full 15 rounds with Joe Louis, world champion, losing only on points. "Tommy" Farr was the first Briton to fight for the world heavyweight title since 1911. He relinquished the British title early in 1938.

**Farragut, DAVID GLASGOW** (1801-70). American sailor. Born at Knoxville, Tenn., July 5, 1801, of Spanish descent, he entered the navy, and in 1825 was promoted lieutenant. When the Civil War came in 1861, notwithstanding his southern birth, he offered his services to the Washington government, and in 1862 was given command of the Western Gulf blockading squadron. His great popularity was intensified by his brilliant forcing of the passage of the Mississippi and capture of New Orleans. After an unsuccessful operation against Vicksburg, with the aid of monitors he defeated Buchanan at Mobile in 1864, but his health being undermined by the climate he returned to New York the same year, being made the first rear-admiral of the U.S. navy. In 1866 he was promoted admiral, and retired 1867. He died at Portsmouth, New Hampshire, Aug. 14, 1870.

**Farrant, RICHARD** (c. 1530-80). British organist and composer. A gentleman of the Chapel Royal, Farrant was for some time organist of S. George's Chapel, Windsor. Much of the music attributed to him has been proved to be by other composers, but it is probable that he composed the beautiful anthems, *Call to Remembrance*, and *Hide Not Thou Thy Face*. He died Nov. 30, 1580.

**Farrar, FREDERIC WILLIAM** (1831-1903). British divine and writer. Born at Bombay, Aug. 7, 1831, he was educated at London University and Trinity College, Cambridge, and became in 1855 an assistant master at Harrow. He was headmaster of Marlborough College from 1871 to 1876, when he became canon of Westminster and rector of S. Margaret's, being appointed archdeacon of Westminster in 1883. Farrar



*Elliot & Fry*

was made dean of Canterbury in 1895. His *Life of Christ*, 1874; *Life of S. Paul*, 1879; and *Lives of the Fathers*, 1889, were successful; but he is also remembered for his school stories, including *Eric*, or *Little by Little* (q.v.), 1858. Dean Farrar died March 22, 1903.

**Farren, ELIZABETH** (c. 1759-1829). British actress. The daughter of a Cork surgeon turned actor,



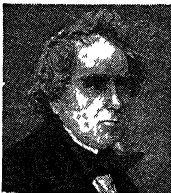
*After Sir T. Lawrence*

she made her first London appearance at The Haymarket, June 9, 1777, as Kate Hardcastle. She made her debut at Drury Lane, Sept. 8, 1788, as Charlotte Rusport in *The West Indian*, and acted at this theatre and The Haymarket till her retirement in 1797. At Drury Lane she succeeded Mrs. Abington as the impersonator of fine ladies, e.g., Lydia Languish, Millamant, Lady Teazle, and Angelica in Congreve's *Love for Love*. In 1797 she married the 12th earl of Derby. She died April 23, 1829.

**Farren, ELLEN OR NELLIE** (1848-1904). A British actress. A granddaughter of William

Farren (v.i.), and born at Liverpool, April 16, 1848, she played in comedy, farce, and burlesque at Sadler's Wells, The Olympic, and Queen's. She joined John Hollingshead's company in 1868 at the (old) Gaiety Theatre, where she remained under his management, and that of George Edwardes, till her retirement in 1891. She was unrivalled as principal boy. She died April 28, 1904.

**Farren, WILLIAM** (1786-1861). British actor. He made his debut on the London stage, Sept. 10, 1818, as Sir Peter Teazle at Covent Garden, where he remained till 1828. He played Sir Peter at Drury Lane, Oct. 16, 1828, remaining a member of the company till 1837.



*From a daguerreotype by Mayall*



*From an old print*



*Downey*

He returned to Covent Garden, which he left a few years later to join Benjamin Webster as stage-manager at The Haymarket, where he stopped ten years. Subsequently he managed The Strand and The Olympic, taking leave of the public at The Haymarket, July 10, 1855, in his favourite part of Lord Ogleby in *The Clandestine Marriage*. As the old man of 18th-century comedy he was unrivalled. He died Sept. 24, 1861.

**Farrer, THOMAS HENRY FARRER, 1ST BARON (1819-99).** British economist. The son of a London solicitor, he was born June 24, 1819. Educated at Eton and Balliol College, Oxford, he became a barrister, but his career was influenced by his close friendship with Sir Stafford

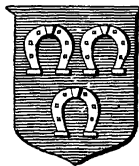


*Farrer*

Northcote, who secured for him in 1848 a position in the board of trade. During 1865-88 he was permanent secretary to the board. He was instrumental in securing legislation concerning merchant shipping and bankruptcy. In 1883 he was made a baronet, in 1893 a baron. As an economist Farrer made his reputation after his retirement. He was a strong free trader and a critic of high national expenditure and bimetalism. He died Oct. 12, 1899. Of his writings the best known is *Studies in Currency*, 1898.

**Farrier.** Name given originally to a man who shod horses, the word being derived from the Latin *ferrum*, iron. After a time the farrier began to attend to the diseases of the horses, and farriery was the name for what is now more generally known as veterinary surgery (*q.v.*).

**Farriers' Company, THE.** London city livery company. Dating from 1356 as a fraternity, it was granted a charter in 1674. Farriers, who were also called ferrers, ferriers, and ferrones, are mentioned in the 13th century. They owe their ordinances to a complaint that certain unskilled



**Farriers' Company arms**

ferrones, having set up forges in the city, had caused damage to or loss of many horses. In 1758 an act of common council confirmed on all operative farriers the obliga-

tion of taking up the freedom of the company. While this rule has been abandoned the company has long taken an active interest in the welfare of the craft by the offer of prizes for good workmanship, etc., and in 1890, in cooperation with the Royal Agricultural Society and the Royal College of Veterinary Surgeons, promoted a scheme for the national examination and registration of farriers or shoeing-smiths. The archives of the company were almost entirely destroyed by fire in 1666. Its offices are at 80, Bishopsgate, E.C.

#### **Farringdon Street.**

London thoroughfare running S. from Charterhouse Street to Ludgate Circus, E.C. Named after the city ward in which it is situated, it was built over the Fleet Ditch, now a sewer, in 1826-30. Fleet Market, which once occupied the site, was opened Sept. 30, 1737, and for 92 years remained a centre for the sale of meat, fish, and vegetables. It was removed in 1829-30. The market for fruit and vegetables built between Farringdon Street and Shoe Lane, N. of Stonecutter Street, and known as Farringdon Market, was opened Nov. 20, 1829, but the site, which covered 1½ acres, was sold in 1892 and later covered by a fine block of buildings.

Farringdon Street is spanned by Holborn Viaduct, and contains the Memorial Hall (*q.v.*), built to commemorate the fidelity to conscience of 2,000 ministers ejected from the church in 1662 by the

Act of Conformity; The Fleetway House, headquarters of the Amalgamated Press; and is fronted on the E. side by part of the London Central (Smithfield) Markets. Fleet Prison stood on ground partly occupied by the Memorial Hall.

N. of Charterhouse Street is Farringdon Road, notable for its open market and bookstalls, with a Metropolitan rly. station (Farringdon) and a large goods station and depot. Farringdon Road was originally called Victoria Road. It extends to King's Cross Road, and was made in 1856. Street and road were heavily damaged by German bombs in the Second Great War, over 100 lives being

lost when a rocket bomb fell, March 8, 1945. See Fleet Prison.

**Farrow's Bank.** Former British bank. Founded in 1904 by Thomas Farrow (1862-1934), it was registered as a credit bank under the Industrial and Provident Societies Act. In 1907 it was registered as a joint stock company. With a capital of £1,000,000, the bank had 75 branches, mainly in England. The bank closed its doors in Dec., 1920, with great loss to small depositors, and in 1921 Farrow and another official were sentenced to imprisonment for fraud in that connexion.

**Fars or FARSISTAN.** Province of Persia. It lies on the E. side of the Persian Gulf, and is bounded on the N.W. by Khuzistan and Isfahan, E. by Yezd and Kerman, S. by Laristan. From the warm coastal plain the country rises into the mts., where the climate is cold. The highest mt. is the Kuh-i-Bul, 13,000 ft. The rivers are small and not numerous. There are several lakes, the principal being Niris. The capital is Shiraz, and the chief port Bushire. The province con-



**Farringdon Street.** View looking north towards Holborn Viaduct; on right, marked by clock, is The Fleetway House

tains the ruins of Persepolis, ancient capital of the Persian empire. Many parts of the province are fertile, and produce wheat, barley, rice, cotton, fruits in profusion, and an excellent tobacco.

**Farsetia.** Genus of annual and perennial herbs and sub-shrubs of the family Cruciferae. Natives of S. Europe, Asia, and Africa, they have opposite, undivided leaves, and white or yellow flowers.

**Farson, NEGLEY (b. 1890).** American journalist. Born at Plainsfield, N.J., May 14, 1890, he went to Pennsylvania university and became a civil engineer. After the First Great War he represented the Chicago Daily

News as special correspondent in India and Egypt, and later in Europe, spending five years in London. He resigned in 1935. His autobiography, *The Way of a Transgressor*, 1935, attracted wide attention by its vivid and adventurous subject matter. His other books included *Behind God's Back*, 1940, *Bomber's Moon*, 1941, and *Going Fishing*, 1942.

**Farthing** (A.S. *feorþa*, fourth). Name of the smallest British bronze coin, value one quarter of



Farthing. Obverse and reverse of a 1949 George VI farthing

a penny. From its first appearance under Edward I, until about 1555, it was a silver coin. A copper farthing was coined in 1613, but did not form part of the true coinage till a reissue in 1672, under Charles II, who also struck a tin farthing, with a circle of copper inset, in 1684. Copper half-farthings circulated between 1842-69. The farthing became a bronze coin in 1860, and has a standard weight of 43.750 grains. The coin is legal tender up to the number of four at one time. The wren design introduced on the reverse of the coin in 1937 is said to symbolise the least of the British coins by the smallest of British birds.

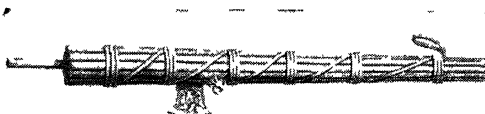
**Farthingale** (Span. *verdugado*, hooped). Hooped framework supporting and extending a wide skirt. The fashion was introduced from Spain into England in the time of Elizabeth, and continued until about the middle of the 17th century. It grew to a prodigious size, the big hoop at the level of the hips giving a flat, circular surface, and keeping the skirt well away from the figure. The farthingale, as it was then called, was revived in rather a different form in the time of Queen Anne, when the skirt became more bell-shaped. It was abolished by royal command in George IV's reign. See Costume.

**Farukhabad.** District and town of India. In the E. of the Agra division of the United Provinces, the area of the district is 1,642 sq. m. The town was founded early in the 18th century. Farukhabad city lies near the Ganges, on the rly. from Cawnpore to Muttra, and at the end of a

branch of the E. Indian rly. from Shikohabad. It forms with Fatehgarh, 3 m. S.E., the headquarters of the district and the cantonment, a single municipality. Cloth printing is the chief industry. The principal crops are wheat, barley, millet, and gram; the poppy, cotton, and sugar-cane are also grown; tobacco is exported. Pop. of dist., 955,377, five-sixths Hindus.

**Farwell, SIR GEORGE** (1845-1915). English judge. Born at Codsall, Staffs, Dec. 22, 1845, he was educated at Rugby and Balliol college, Oxford, and called to the bar in 1871. Judge of the high court from 1899, he gave judgement in the famous Taff Vale (*q.v.*) case, in 1901. Reversed by the court of appeal, his judgement was upheld by the house of lords, and led directly to the passing of the Trade Disputes Act in 1906. Farwell was a lord of appeal 1906-13. He died Dec. 30, 1915.

**Fasano.** Town of Italy, in the prov. of Brindisi. It is 35 m. by rly. N.W. of that port. The old palace of the Knights of S. John is now the town hall. In the vicinity are the ruins of Egnatia, an ancient port on the Appian Way. Situated in an olive-growing district, Fasano has many oil mills. Pop. 17,180.



Fasces. Roman symbol of magisterial authority

**Fasces** (Lat. bundles). Bundles of rods with an axe bound up in the centre. Such a bundle was the emblem of authority in ancient Rome, although it originated with the Etruscans. Fasces were carried before the consuls by lictors. The consul was preceded by twelve lictors bearing fasces, and the head of the state by 24; praetors of towns, of provinces, and of the army, had fewer. Under the empire the consuls, who then ranked merely as civil magistrates, had eight fasces. Fasces have been used as their emblem by various Italian political associations, and were adopted by Mussolini in 1919 as the badge of his party. See Fascism.

**Fascia.** In anatomy, layer of connective tissue interposed between the skin and the muscles, and prolonged inwards between the muscles so as to form sheaths around them. The strength and

thickness of fascia vary in different parts of the body. On the outer side of the thigh, *e.g.*, it forms a dense, strong structure, the *iliotibial band*, which helps to steady the body in the erect position.

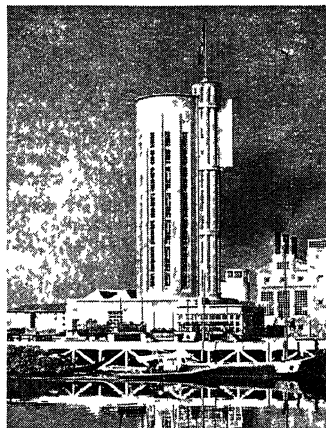
**Fascia** or **FACIA** (Lat. bandage, fillet). Architectural term applied originally to the bands or divisions of an Ionic entablature (*q.v.*), now extended to include any flat band or facing in an entablature. The strip of boarding over a shop front, bearing the name of the firm, is known as a fascia board.

**Fasciation.** Abnormal growth of stems when they become flattened, and the branches, instead of being separate, coalesce with the stem. This is the constant condition of the flowering parts of *Celosia cristata* (cock's comb *q.v.*); but is often found in other herbs and trees. The willow family and the ash often exhibit the abnormality in their upper branches.

**Fascine** (Lat. *fascina*, faggot). Cylindrical bundle of brushwood 6 to 18 ft. long and 6 to 9 ins. in diameter used in revetments of military earthworks. A fascine is built up on trestles and compressed by means of a choker or chains, and then bound at intervals with withies of flexible wood. When made of long, heavy boughs, a fascine is called a saucisson. Fas-

cines are also used in making sea and river walls to protect foreshores subject to washing, or to collect sand and silt to raise the bottom of water-covered

land to form an island, as a break-water against inroads or for land reclamation, as in the Netherlands.



Fasces. Mussolini's party badge applied to architecture: a factory at Torre di Zuino, Italy

## FASCISM: A POLITICAL THEORY

C. M. Franzero, Journalist and Writer on Italian Affairs

*The rise, doctrines, and history of the party which, embodied in Mussolini, ruled and ruined Italy between 1922 and 1943 See also Italy; Mussolini; Nazism*

Fascism was the name given to the political theory of the Italian party founded by Benito Mussolini in March, 1919, in Milan. It became, after the seizure by Mussolini of power in Oct., 1922, a synonym for the regime that governed Italy until July 25, 1943. The name, taken from the *fascies* (v.s.), was chosen to symbolize the close union of its adherents: its emblem was the fascies of the lictors on a tricoloured shield.

Fascism, as a doctrine and as a political conception, stood in direct antithesis to socialism and liberalism. Whereas the philosophy of both socialism and liberalism is based upon the importance of man as an individual, and national life is the sum of the aggregate of individuals in each country, according to fascism the state was paramount, and the individual of value only in so far as he subjected his interests to those of the state. No individual or group outside the state—political parties, cultural associations, economic unions, social classes was allowed. Fascism did not recognize the class-struggle likewise, and was opposed to trade unionism.

### Fascist Scorn for Peace

Fascism did not believe in the feasibility or utility of perpetual peace—a tenet which was the actuating principle of Italian foreign policy from 1922 until 1940. It discarded pacifism as implying supine renunciation, and proclaimed war as the apex of all human energies at their maximum tension. It despised all international structures such as the League of Nations—even if it accepted them as useful or expedient in the ordinary intercourse of international relations and politics. Instead, fascism exalted nationalism as the noblest human aspiration. Lastly, fascism rejected the economic interpretation of felicity as something to be secured socially at a given stage of economic evolution; though it found no better substitute for this than its somewhat cumbersome and obscure conception of the corporate state. From such a philosophy there could only follow, in the actual application of fascism as a form of rule, dictatorship described as the totalitarian state.

It is odd to recall that fascism was founded by Mussolini, who

had been a rabid socialist. One explanation might be that in 1919, when Italy after the First Great War found herself in the throes of spiritual and economic turmoil, socialism in that country, as a doctrine, was dead, and it existed in practice only as a grudge. In such conditions, it is understandable that fascism, with its conception of national will power as a manifestation of the country's vitality, should have appealed strongly to the politically untrained Italian masses.

### Its Revolutionary Programme

The first programme of fascism (March, 1919) was decidedly revolutionary. It demanded a constituent assembly which was to be the Italian section of the International Constituent Assembly of the Peoples; the proclamation of an Italian republic; the sovereignty of the people and the extension of the vote to women; the abolition of the senate; the abolition of all titles of nobility; the abolition of compulsory military service; international disarmament; dissolution of limited liability companies; abolition of the banks; conscription and limitation of private capital; confiscation of unproductive capital; the land for the peasants; management of industry transport, and public services by unions of technicians and workers.

This programme, however, was soon abandoned, and replaced by propaganda likely to secure to the new party the financial backing of the industrialists and the support of the lower middle classes, which in Italy are the backbone of the country. At the elections of 1919 no fascist candidate was returned; but during 1920 the new ideas gained ground, and Italy saw the coming into existence throughout the country of *squadre* or bands of young men calling themselves *squadristi*, mostly ex-servicemen made desperate by the prevailing disorder, who took upon themselves what they considered the defence of the nation against the revolutionary tyranny of the "red" elements. At that time there was as yet no real fascist doctrine beyond this vague sense of outraged patriotism; but when at the end of 1922 the party seized power, fascism soon caught the people's imagination and secured

general collaboration by a programme that can be summed up as follows: the prestige of the state to be restored at all costs; the national finances to be placed on a sound basis; private property to be recognized in its social function; the state to control class conflicts; no strikes in public services to be tolerated; in foreign affairs, Italy to reaffirm and fulfil her mission as the bulwark of Latin civilization in the Mediterranean.

Only too soon it became clear that the fascist party meant to be one with the state, and that the regime was to all intents and purposes a dictatorship. But Mussolini enjoyed a vast degree of popularity; he knew the art of making people endure his iron fist; and he never let events, internal or external, deflect him from making the entire life of the nation subservient to his ambitions and imperialistic dreams. Fascism, as an imposition of a dictator's will upon the people, touched its peak in June, 1940, when fascist Italy entered the Second Great War on the side of Nazi Germany, only to suffer defeat in every field. Fascism ended when Mussolini was overthrown on July 25, 1943.

### Interweaving State and Party

Twenty years of dictatorial rule were made possible only by interweaving in the closest manner the state and the party, till it was difficult to say where the line of demarcation, if any, existed. The hierarchy upon which the totalitarian fascist state rested was as follows: Mussolini was "chief of the government and Duce of fascism"; from him depended the government, the directorate of the party with its octopus-like machine reaching far and deep into the individual and collective life of the people; and next to Mussolini stood the fascist grand council which was in effect the supreme organ of the nation and had, in 1928, arrogated to itself the right of veto over the succession to the throne. Behind the party and regime was the fascist militia, described as voluntary although its members were handsomely paid and enjoyed exceptional privileges; it was nothing but the private army of the fascist party.

In the field of economics, fascism created the corporate state. The basic Act, 1926, of this new economic system regulated the legal and economic representation of employers and workers in all industries, trades, and professions, including agriculture. Associations for each trade or profession were



formed and called corporations. In 1927 the whole system received its special labour charter, the essential principle of which was that the activities of the corporations must never run counter to the interest of the state. The corporations were empowered to settle disputes over wages and labour, and to nominate members to sit on their many boards; eventually from the corporations were chosen the representatives who in 1937 composed the fascist chamber of corporations or the new kind of parliament of the fascist state, to take the place of the elective chamber of deputies, now discredited.

The labour charter of 1927 asserted the subordination of the individual citizen to national interests, and, although recognizing private initiative as the most effective instrument of production, it held the organizers of industry responsible to the state for results. Rapidly the whole system turned the entire economy of Italy into a machine working solely for the preparation of war. State finances, private capital, scientific research, technical direction, manual and intellectual labour—everything was made to converge towards the organizing of the corporate state for the ultimate end of war. The state and its interests were the supreme expression of the nation's life, with the dismaying result that when the fascist state collapsed, Italy crumbled into appalling chaos, political and economic.

#### The Movement outside Italy

The doctrine of fascism found many admirers, especially in its earlier period, when the iron rod of Mussolini's rule seemed to many foreign onlookers to work miracles in redressing the course of Italy's national life. Even in Great Britain a fascist movement sprang up, under the leadership of Sir Oswald Mosley, who in his varied career had been a conservative, a socialist, and an independent. His movement, modelled on German Nazism rather than Italian fascism, struggled on until it was banned in July, 1940. In several other countries the doctrine of fascism made its influence felt under different names and with various degrees of success, notably in Hungary, Rumania, Belgium, Spain, and Argentina. The most famous derivative from fascism was the National Socialist (Nazi) movement, founded by Adolf Hitler in Germany, where the disciple in every way surpassed the master, with what tragic results for mankind the world will never forget.

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**Fascists, BRITISH UNION OF.** Political party formed by Sir Oswald Mosley (*q.v.*) in 1931 after the collapse of his New Party (*q.v.*). Organized on German-Italian fascist lines, the B.U.F. was anti-Jewish and sought to introduce the leadership principle into government. Members wore a black uniform, used the Nazi-fascist salute with upraised arm, and sang the Horst Wessel song with an English text. The badge was a lightning flash surrounded by a circle. The B.U.F. caused serious disturbances by uniformed marches through the East End of London, members bearing anti-Jewish slogans, and in 1936 the Public Order Act forbade the wearing of political uniforms. A split occurred in 1937, when William Joyce (*q.v.*), formerly director of B.U.F. propaganda, and others broke away to form the National Socialist League.

Early in the Second Great War the union organized a campaign for concluding peace with Germany. On May 23, 1940, the police raided its headquarters in Westminster and arrested 34 members, including Mosley. The union was banned, July, 1940, and its leader and other members interned under defence regulation 18B (*see* Defence Regulations). In 1946 it was stated in the house of commons that before the war the Italian government subsidised the B.U.F. to the extent of £60,000 a year.

**Fasher**, EL. Town in the Anglo-Egyptian Sudan. Capital of Darhur province, it lies about 200 m. W. of El Obeid, and is a junction on the Sudan government rlys. and the centre of caravan trade.

**Fashion** (Lat. *fatio*, making; through old French *fachon*, method or *mode* of making). Without losing its general meaning, the word fashion has now acquired so close a relationship to the changing modes of clothing, particularly feminine clothing, that standing by itself it is taken to mean nothing else. The origins of feminine fashion have been examined throughout the centuries, largely by male (and frequently disapproving) observers. There exists a considerable literature on the subject, covering diverse considerations fanning out into psychology, history, sociological ideas of modesty, and the unsolved

problem of what constitutes beauty and good taste.

Fashion in the present period of organized commerce in dress, when the trade must both create and meet a demand, has one constant characteristic: it must change; and to serve this end producers of clothing have in the last hundred years drawn all branches of the cloth-making and allied trades into cooperation. This movement began in France, which has for centuries enjoyed a particular prestige in all that concerns feminine dress.

British producers of dress are now following the same method, which involves the close working of dress designers with spinners and weavers. The technique of designing for fabrics is intricate, as yarn suitable for one cannot be successfully woven into another. There are schools of instruction, and the successful designer is one who is thoroughly acquainted with the theory and practice of dyeing, spinning, and weaving.

#### Introduction of the Short Skirt

Since the French Revolution, changes of fashion have been dictated chiefly by leading dress-makers. Their power has naturally been principally exercised to secure prosperity for their trade, rather than for any aesthetic ends. Thus, when war broke out in August, 1914, women were wearing long, narrow (hobble) skirts. Early in 1915 the dressmaking dictators of Paris, afraid that women would buy fewer clothes in the interests of economy, introduced shorter and very wide skirts. The markets were flooded with these to such an extent that by 1916 a woman in a pre-war skirt found herself unpleasantly conspicuous in the street.

The great expansion of the ready-made clothing trade after the First Great War improved public taste, giving a certain self-confidence to the average woman in her ideas about clothes, and the big dressmaking groups have found their dictates ignored on occasion. Tight-lacing, boned collars, boned bodices, and other restricting features of dress never returned after 1918, though attempts were made from time to time to introduce them again, for the benefit of the manufacturers of the accessories which such styles demand. In 1930 ankle-length skirts for outdoor wear were launched on the fashion market; women would have nothing to do with them, though they accepted long-skirted evening dresses. Good

taste was still further stimulated in the public by the employment of recognized experts in the designing of Utility (*q.v.*) clothing during and after the Second Great War.

The influence of the films on women's dress is great; but, while the fashions worn by film-actors are extreme, economic and other reasons lead to their modification before they are offered to the public. The fashion press, an extremely popular form of reading, devotes itself principally to extreme modes. Its attraction, however, is comparable to that "window-shopping" which is a habit of many women with limited purses.

An admirable summary of fashion and its influences is Miss Thalassa Cruso's introduction to the London Museum catalogue, Costume Section. See Costume; Dressmaking; Shoe; Skirt, etc.

H. Pearl Adam

**MASCULINE FASHION.** Fashion in male attire is evolutionary rather than subject to external dictation, and the changes are therefore slower and less perceptible. The last radical change in W. Europe was that from knee breeches to trousers at the end of the 18th century. During the 19th century the skill of the English, and especially London, tailors in the making of suits from the heavier cloths demanded by the conditions of industrial urban life established an ascendancy and set the standard for Europe and America, and even for the Far East, where the wide adoption of European dress at the expense of traditional native costume was an indirect tribute to English tailoring. London still sets the standard, one of quality rather than fashion, and unconscious rather than deliberate.

The basis of men's wear has remained the same for 150 years: hat, overcoat, coat, waistcoat, trousers. The shapes have varied in detail, giving rise to such transient extravaganzas as the shepherd's-plaid trousers of the 1850s or the "Oxford bags" of the 1920s. Sometimes bright colours are favoured, sometimes the tendency is towards sombre hues. Commercial enterprise may popularise certain minor adjuncts, *e.g.* straw boaters, cummerbunds, spats, suede shoes, but cannot ensure their endurance. Other modifications have sometimes been introduced in emulation of the idiosyncrasies of a public or popular figure of the day (*e.g.* Beau Brummell, Lord Raglan, Edward VII, the duke of Windsor,

Anthony Eden), but such emulation has been both voluntary and capricious. The result of any attempt to impose a new fashion is well exemplified in the failure of the Sandringham (or Daily Mail) hat, introduced 1919-20. Masculine taste shrinks from sudden novelty. Such changes as occur have usually been first thoroughly established in less formal garb, such as sports wear or undress service uniform. For the rest, much depends on the materials and their price, but even more, in Great Britain, on masculine subservience to the unwritten canons, taboos, and prejudices of "good form," which even on such matters of sartorial etiquette as the avoidance of brown shoes with a navy blue suit or the disregard of the lowest waistcoat button is not to be lightly altered or transgressed.

#### Comfort and Informality

The general direction of evolution has been steadily towards greater informality and comfort. Thus the coat has gradually become a jacket, the vent at the back, which disappeared after the First Great War, marking the last vestige of tails; silk hat and bowler have given place to the soft felt hat—or to none; collars once high and stiff have become low and soft; the elaborate stock has become a simple knotted tie; boots have become shoes. A second tendency has been towards the elimination of social distinction in dress by the mass production of ready-made clothing.

In the matter of whiskers, beards, and moustaches, fashions have changed more swiftly and often inexplicably. But the beards grown during the Crimean war may be held responsible for those of two whole generations of Englishmen; Lincoln's goatee was widely copied in the U.S.A.; and at least two film actors, Chaplin and Colman, helped to establish moustache styles in two continents. Nevertheless, masculine independence is demonstrated in the fact that beards were never less worn in Great Britain than throughout the reign of George V, a popular, yet bearded monarch.

*Consult* Taste and Fashion, J. Laver, rev. edn. 1945.

Gordon Stowell

**Fashoda Incident.** Name given to an episode which occurred just after the British reconquest of the Sudan in 1898. A small French expedition under Major (afterwards General) Marchand made its way from the French Congo to Fashoda (now Kodok), occupying it on

Sept. 7, in spite of the fact that in 1895 the British government had given formal notice that the Nile valley was within its sphere of influence. Sir Herbert Kitchener, then sirdar, went at once to Fashoda and asked Marchand to withdraw. The French officer refused, but on Nov. 5, after further negotiations, his government ordered him to give up the post. By an agreement signed March 21, 1899, France undertook to withdraw from the Nile valley, and a new boundary between the areas protected by the two countries was outlined. The affair caused much excitement in both countries.

**Fast and Loose.** Dishonest game formerly much played by gipsies and tricksters, known also as prick the garter. The victim was invited to push a pin or bodkin through a folded belt so as to fix it to a table, but the folds were so disposed by the owner that on the ends being pulled it came free, and the stake was forfeit. From this came the expression "to play fast and loose," *i.e.* to repudiate expressed obligations which it is no longer convenient to acknowledge.

**Fast Castle.** Ruined fortress of Berwickshire, Scotland. It stands on a steep cliff about 3½ m. N.W. of St. Abb's Head, and was formerly a stronghold of some importance, though little now remains of the buildings. It was to Fast Castle that James VI of Scotland was to have been brought by the Gowrie conspirators, and it is described as Wolf's Crag by Scott in *The Bride of Lammermoor*.

**Fast Colours.** Broadly speaking, colours which behave satisfactorily in wear for a reasonable time—say, six months. Colours should be fast against sunlight and water, rubbing, the action of street mud, and of perspiration. Colours are frequently required to be fast against specific finishing or manufacturing processes, *e.g.* against milling and potting. See Dyes.

**Fasti** (Lat. *fas*, divine law). Latin word meaning lawful, applied to those days (*dies fasti*) in the year on which legal business could be done, as opposed to days on which it could not (*dies nefasti*). The word then came to mean a calendar. Such calendars were of two kinds: *Fasti diurni*, a calendar indicating religious festivals, market days, etc.; *Fasti annales*, a calendar giving the names of the magistrates for the year and the chief events.

**Fasting** (A.S. *faestan*, to hold fast, observe). Total or partial abstinence from all or special kinds

of food and drink. Such abstinence has been practised for religious or other reasons by people of all nations from early times. It has formed part of both pagan and Christian asceticism (*q.v.*), in a religious sense being enjoined or commended together with prayer and almsgiving, and regarded as a method of self-discipline which, controlling the animal appetites, enables the mind more clearly to apprehend spiritual truths.

The Mosaic law prescribed one great fast day in the year, the Day of Atonement or 10th day of the 7th month (Lev. 16); others were added in commemoration of events connected with the captivity (Zech. 8); and in the O.T. many instances are recorded of individual and communal fasting. The king of Nineveh, when Jonah prophesied its fall, proclaimed a general fast, and the city was spared (Jonah 3). In the N.T. Jesus Christ is represented not as enjoining His disciples to fast, but as teaching that, whenever fasting was undertaken, it was to be without ostentation and with purity of intention (Matt. 6). At the same time He indicated that it would be a duty after His departure (Matt. 9; homily On Fasting ii); and said of certain demons (Mark 9, A.V.): This kind can come forth by nothing but by prayer and fasting (R.V. omits "and fasting"). Fasting was recommended and practised by the apostles (Acts 13, 14; 2 Cor. 6, 11). In the early church fasts were kept on Wednesdays and Fridays, and during Lent.

#### The Rules in the Churches

Unlike the Roman Catholic Church, the Church of England makes no distinction between fasting and abstinence (*q.v.*). In the homily On Fasting, the custom is said to be of itself a thing merely indifferent. It is regarded not as a means of grace but as a preparation for the means of grace, and is voluntary, and the rule, obligatory among Roman Catholics, as to partaking of the Holy Communion fasting, is observed only among High Church Anglicans. The proclamation of 1548 for the abstaining from flesh in Lent time (2 and 3 Edward VI, c. 19) was issued for political and economic reasons. At the same time, the Book of Common Prayer enumerates as days of fasting or abstinence the 40 days of Lent, Ember days, Rogation days, all Fridays except Christmas Day, and the evens or vigils of certain festivals where these festivals do not fall on a Monday, Sunday never being a fast day.

The manner of fasting or abstinence is left to the individual.

In the Roman Catholic Church all baptized persons who have completed their 21st year are bound to observe the days of fasting, on which they may not eat more than one full meal, this meal to be without flesh meat, and to be eaten after mid-day. The days of fasting are all Lent, except Sundays, the Ember days, vigils of the more

tion of life under such conditions varies within wide limits. Instances are well authenticated of survival for upwards of forty days if water is freely taken. The lord mayor of Cork, Terence MacSwiney, in 1920 fasted in Brixton prison, dying, after abstaining from food for 73 days, on Oct. 25. After a prolonged fast the stomach is unable to exercise its functions normally, and at first very small quantities

of liquid and easily digested food should be given. Limited fasting forms part of many nature cures. See Hunger Strike; Starvation.

**Fastnet.** Rock off the S.W. coast of co. Cork, Eire. It has a lighthouse showing a flashing light visible for 18 m.

**Fat.** Chief constituent of fatty or adipose tissue, which is present to a varying extent in nearly all parts of



Fastnet, Eire. An air view, showing lighthouse (completed 1907) and base of an earlier, demolished lighthouse

solemn feasts, all Fridays except those falling within 12 days of Christmas, and between Easter and the Ascension. Fasting is exceptionally strict in the Eastern Church, in which 226 days are set apart for it in the year; it is an important religious duty among the Hindus; and among Mahomedans, who regard the practice as mitigating the penalties of sin, the month of Ramadan (*q.v.*) is a period in which fasting is obligatory. In ancient Greece rigid fasts preceded the solemnities of the Eleusinian mysteries; and in Rome every fifth year a general fast was held in honour of Ceres.

From a physiological or medical point of view, abstention from food leads to the tissues of the body being consumed in order to maintain the output of heat and energy. Hence, progressive emaciation occurs, absorption of the fat in the tissues being well marked. The face becomes pale, the cheeks sunken, and the eyes hollow. The abdomen sinks in and the bones become prominent. The temperature is often subnormal.

Towards the end, mental symptoms may appear and hallucinations may be followed by coma and death, the immediate cause of which appears to be reduction of the bodily temperature. The dura-

tion of the body. Adipose tissue consists of a foundation of connective tissue in the meshes of which are the fat-cells containing an oily material which is a mixture of palmitin, stearin, and olein formed by combination of fatty acids with glycerol. Chemically, fat consists of carbon, oxygen, and hydrogen, and it provides a reserve of material which can be drawn upon to maintain the heat and energy of the body. See Obesity; also Fatty Acids; Fatty Oils, etc.

**Fatalism** (Lat. *fatum*, fate). View that all the events of human life are ordained beforehand by an absolute necessity. Such was the view of Epicurus and the Stoics, and it is held by Mahomedans at the present day. Fatalism differs from determinism, according to which events stand in a relation of cause and effect to other events immediately preceding, in that it asserts that, no matter how much the antecedent causes may be varied, it will not affect the pre-ordained result. See Free Will.

**Fata Morgana.** Form of mirage seen in the straits of Messina between Sicily and Calabria, supposed to be the work of a fata or fairy named Morgana. In this type of mirage, which is seen across calm water, inverted images of ships, etc., are seen in the air

above the real objects. The term is used to describe a mirage (*q.v.*).

**Fat Boy**, THE. Character in Dickens's *Pickwick Papers*. Page-boy to Mr. Wardle, Joe is enormously fat, given to somnolence, and often quoted for his desire to "make your flesh creep."

**Fatehganj**. A village of the United Provinces, India. In the district of Bareilly, it is 23 m. S.E. of Bareilly, and was founded to commemorate the British victory over the Rohillas in 1774. A few miles N.W. in the same district there is another village of this name, where the Rohillas were defeated by the British in 1796. Pop. 4,200, two-thirds Hindus.

**Fatehgarh**. Town of the United Provinces, India. The headquarters of Farukhabad district, it forms with Farukhabad city, 3 m. to the N.W., a single municipality. The fort near the Ganges was built in 1714 by Nawab Mahommed Khan. A monument commemorates the European residents who lost their lives in the Mutiny of 1857. See Farukhabad.

**Fatehpur**. Dist. and town of the United Provinces, India, in the Allahabad division. The area of the district, which lies between the Ganges and the Jumna, is 1,642 sq. m. Slightly more than half the district is under cultivation, the chief crops being gram, barley, wheat, rice, and cotton. Fatehpur town is on the E. Indian railway. Pop. dist., 806,944, 90 p.c. Hindus; town, 20,000.

A second town of the same name, which is situated in the Bara Banki district of the United Provinces, is noted for its old buildings, some of which tradition assigns to the 14th or 15th century. Pop. 7,100, three-fifths Mahomedans, two-fifths Hindus. A third town belongs to the Sikar chiefship in Jaipur state, Rajputana. It is 146 m. N.W. of Jaipur. Pop. 21,000, two-thirds Hindus, 30 p.c. Mahomedans.

**Fatehpur Sikri**. Town of the United Provinces, India. It is 23 m. W.S.W. of Agra city, and was founded in 1569 by the Mogul emperor, Akbar, to whom the saint Salim Chishti foretold the birth of a son (the emperor Jehangir). A wall nearly 5 m. long runs along three sides of Akbar's town. The modern town lies near the western end. Prominent among the buildings are the mosque with Salim Chishti's mausoleum in the quadrangle, the palace named after Akbar's Rajput wife, and his own palace and audience halls. Pop. 7,200, three-fifths Hindus.

**Fates**. In classical mythology, goddesses who presided over the destinies of men. By the Greeks they were called Moirai, by the Romans Parcae. They were three in number, and were daughters of Zeus and Themis, or daughters of Night and Erebus. Clotho, the youngest of the three sisters, held the distaff which spun the thread of life; Lachesis mixed good and evil fortune with it; Atropos cut the thread at the allotted moment. They were very powerful goddesses, with whose decrees even Zeus himself was unwilling to interfere. In art the Fates are generally represented as aged women, but sometimes as maidens of grave mien: Clotho with a distaff or book of fate; Lachesis pointing with a staff to a globe; Atropos with a pair of scissors or a pair of scales.

**Father**. Word common to most Indo-European languages, the forms of which differ slightly in accordance with phonetic laws. Originally denoting a male parent, then by extension a remoter relationship such as ancestor or forefather, it came to be applied to the inventor or first person prominent in any art or pursuit. Thus, the Greek historian Herodotus is popularly called the father of history. Father is also a term of respect, as conscript fathers for the senators of ancient Rome; father of his country for Cicero, Augustus, and other emperors; father Thames and father Tiber. Special applications are the Pilgrim fathers, the first settlers in North America; father of the house, he whose membership of the house of commons has been longest without a break; father of the chapel (*q.v.*). In theology, Father is used for the Supreme Being, the First Person of the Trinity; for a priest of the Roman Catholic Church; and for the earliest Christian writers. In Rome the father of the family had very wide powers over his children and household. See Family; Fathers of the Church; Patria Potestas.

**Fatherhood**. Theological term for one aspect of the relationship of God to the universe generally, and to man particularly. In most ancient religious systems the idea of paternity, usually associated with that of maternity, is connected with the Deity or the chief of the deities worshipped. In monotheistic systems the ideas of paternity and maternity are combined in one God who is the cause and progenitor of all existence.

In Christian theology the term father is applied to the First Person of the Trinity as expressing

both a special relationship to the Son and an attitude as Creator, sustainer, and chief benefactor of the human race. This aspect of God as the Father of His people was only gradually unfolded in the Hebrew Scriptures, and it was not until post-exilic days that the idea of a warrior king appears to have been superseded by that of a loving and merciful Father. The teaching of Christ developed the doctrine to a degree unknown before. He claimed to be in a special sense the Son of God, and in Him all Christians are the children of God by adoption and regeneration.

**Father Lasher**. A member of either of two species of fish, *Cottus bubalis* or *C. scorpius*, small sea fish of the order Scleroparici.

**Father of the Chapel**. Name given to one who presides over the meetings of employees in a printing or newspaper office. See Chapel.

**Fathers of the Church**. Term specially applied to early Christian writers pre-eminent for learning and sanctity, whose works are regarded as having authority next after that of the Bible. The name seems to have been generally accepted by the 4th century. It has, however, always been used rather loosely. Even writers like Origen, whose orthodoxy was open to dispute, have been included among those who are known as fathers of the church.

The prominent writers of the 1st century were known as the apostolic fathers from their personal association with the apostles, whose teachings they are held to reflect. The list of the church fathers has been held to include writers down to the 12th century; but in common practice it is restricted to those antecedent to S. Gregory the Great (A.D. 604) in the Western Church and to John of Damascus (A.D. 756) in the Eastern. Some authorities, however, regard S. Bernard of Clairvaux (d. 1153) as the last of the fathers.

The chief church fathers are usually divided as follows: *Doctors of the church*—Athanasius, Basil the Great, Gregory Nazianzus, Chrysostom, Ambrose, Augustine, Jerome, and Gregory the Great; *Ante-Nicene Fathers*—Justin Martyr, Clement of Alexandria, Origen, Tertullian, Irenaeus, Cyprian, Gregory Thaumaturgus; *Post-Nicene Fathers*—Eusebius, Cyril of Jerusalem, Gregory of Nyssa, Theodoret, Hilary of Poitiers, Hilary of Arles, Leo the Great, John of Damascus, and others. The Venerable Bede is included in the last category.

In the Roman Church, the fathers, in their testimony to the fundamental doctrines of the faith, are held to be without fault, and their teaching is to be accepted without question; but in details and method of teaching they are of varying authority and value. Among Protestants no such authority is assigned to them; but the general consensus of the fathers is regarded as of the highest importance as showing how the early Church understood the teaching of Christ and His Apostles. The writings of all the chief fathers of the Church are included in Migne's edition, in 387 large volumes, 1844-66; and most of them have been translated into English.

**Fathom.** Nautical measure 6 ft. in length. Cables, etc., are measured by the fathom, and lead lines are marked off in fathom spaces.

**Fatigue.** Condition produced by prolonged or excessive output of activity, due partly to consumption of the available energy-producing materials, and partly to the accumulation in the tissues of the waste products formed during these efforts. The physiology of fatigue in a single muscle can be studied graphically with the aid of the muscle-nerve preparation, obtained by dissecting out the gastrocnemius muscle from the leg of a frog with the nerve attached. In the living being, besides the changes in the muscles, the development of fatigue is increased by the exhaustion of the central nervous system which follows the accumulation of waste products in the blood. Mental or emotional fatigue, however real, can scarcely be measured, though it was studied in both Great Wars.

**Fatigue.** In metallurgy, term used to describe the effect on metals of repeated stresses. Metals possess easily measured limits of elasticity and strength and, under normal conditions, they will not fail unless these limits are exceeded. But if a much lower stress, about half the ultimate tensile stress, be applied repeatedly, either being reduced to zero or reversed between applications, the metal becomes fatigued and does eventually fail.

Failure starts at one or more points where stress becomes concentrated; these may be slag inclusions, tool marks, sharp fillets, oil holes, corrosion pits, etc. The hair-line crack proceeds along the amorphous material at the boundaries of the metallic grains or in slip bands. After some period, these fine cracks reduce the

effective cross-section of the article. An examination of the broken surface of such a failure shows two quite different areas; there is a portion comparatively smooth and discoloured, while the rest of the surface appears either fibrous or crystalline, because of the final tearing of the unaffected metal, which can no longer bear the load. This type of rapidly alternating stress is commonly met with in practice, so it is essential for the engineer to have a method of measuring the susceptibility to such stresses of different metals and alloys. A number of similar test pieces must be subjected to different stresses until fracture occurs or until the number of reversals exceeds ten millions, when the stress is assumed to be within the fatigue limit. Generally steels with a higher tensile stress have greater resistance to fatigue, but local concentrations of stress upset this relationship. Fatigue under conditions favouring metallic corrosion is usually more rapid than failure due to fatigue under normal conditions.

**Fatigue** (Fr. *fatiguer*, to weary). Military term applied to duties as distinct from the use of arms. Normally fatigues are duties performed by troops in connexion with administration of camps and barracks, and include carrying coal, loading baggage, cleansing surface drains and flushing latrines, sweeping yards, clearing snow, moving ammunition, carrying water, etc. Men engaged on fatigues are known as a working party. Fatigues form part of the punishment of men confined to barracks or undergoing detention.

**Fatima** (c. 606-632). Daughter of Mahomet by his first wife Kadijah. Born at Mecca, she was the prophet's favourite daughter, and was called by him one of the four perfect women in the world. She bore her husband Ali three sons, Al-Hassan, Al-Hussein, and Al-Muhsin. From the first two are descended the Fatimate caliphs of N. Africa and Syria.

Another Fatima was the heroine of Perrault's story of Bluebeard, where, as his seventh and last wife, she discovered the bodies of her predecessors. (See Bluebeard.) The name also occurs as that of an enchantress in the Arabian Nights story of Sindbad the sailor.

**Fatshan.** City of China, in the prov. of Kwangtung. It lies in the Si-Kiang and Pe-Kiang delta, 7 m. S.W. of Canton. It has iron and steel industries, and a trade in cereals, oil, timber, and cassia. At

Fatshan Creek, a number of Chinese junks were destroyed by British naval forces during the war of 1857. Pop. est. 400,000.

**Fatty Acids.** Series of monobasic acids with the general formula  $C_nH_{2n}O_2$ , so called because many of them occur in natural fats. (See Fatty Oils.) They are colourless liquids or solids, the lower members of the group possessing a sharp smell and sour taste. The formula given above requires the number of hydrogen atoms to be double the carbon atoms in each acid. The following is a list of fatty acids, arranged in order of their carbon atoms:

$CH_3O_2$	— Formic
$C_2H_4O_2$	— Acetic
$C_3H_6O_2$	— Propionic
$C_4H_8O_2$	— Butyric
$C_5H_{10}O_2$	— Isobutyric
$C_6H_{12}O_2$	— Valeric
$C_7H_{14}O_2$	— Isovaleric
$C_8H_{16}O_2$	— Methylthylacetic
$C_9H_{18}O_2$	— Trimethylacetic
$C_{10}H_{20}O_2$	— Caproic
$C_{11}H_{22}O_2$	— Oenanthylic
$C_{12}H_{24}O_2$	— Caprylic
$C_{13}H_{26}O_2$	— Pelargonic
$C_{14}H_{28}O_2$	— Capric
$C_{15}H_{30}O_2$	— Undecylic
$C_{16}H_{32}O_2$	— Lauric
$C_{17}H_{34}O_2$	— Tridecyllic
$C_{18}H_{36}O_2$	— Myristic
$C_{19}H_{38}O_2$	— Isocetic
$C_{20}H_{40}O_2$	— Palmitic
$C_{21}H_{42}O_2$	— Daturic
$C_{22}H_{44}O_2$	— Stearic
$C_{23}H_{46}O_2$	— Arachidic
$C_{24}H_{48}O_2$	— Behenic
$C_{25}H_{50}O_2$	— Lignoceric
$C_{26}H_{52}O_2$	— Carnaubic
$C_{27}H_{54}O_2$	— Hyaenic
$C_{28}H_{56}O_2$	— Cerotic
$C_{29}H_{58}O_2$	— Melissic

The fatty acids may be roughly divided into two classes, liquid and solid. Those containing ten or more atoms of carbon are solids. All dissolve readily in alcohol and ether. The lower members of the series are soluble in water, but the solubility decreases as the number of carbon atoms increases. The acidity diminishes with the increase in the carbon atoms, this property being utilised in a process for separating the various acids. Another process of separation depends upon the progressive decrease in the solubility of the barium, magnesium, and lead salts. All the fatty acids, except formic and acetic, are oily or greasy. The boiling-point rises about 19° for each addition of CH in the formula, in acids from formic to capric. The melting points of the solids show a similar rise. The volatility of the acids decreases as the carbon atoms increase, so that lauric acid and those higher in the series can be distilled with-

out decomposition only under diminished pressure. The acids with an odd number of carbon atoms are comparatively rare.

**Fatty Compounds.** In organic chemistry, those in which the carbon atoms are connected together by a single linking. They are also known as saturated compounds because chemical changes are brought about by substituting one atom or group by other groups. Another series of organic compounds containing less hydrogen than the fatty compounds are known as unsaturated compounds, as they can combine directly with hydrogen or chlorine. The fatty acids belong to the group of fatty compounds.

**Fatty Degeneration.** Change in the cells of animal tissues in which the constituents of the cell become partly broken down into fat. It may be the result of various diseases, *e.g.* pernicious anaemia, or poisoning by certain substances, such as phosphorus or arsenic, or, more frequently, may follow lessening of the blood supply to an organ owing to narrowing of the arteries. The last is the usual cause of fatty degeneration of the heart.

**Fatty Oils** (formerly called fixed oils). Oils which, unlike hydrocarbon and essential oils, are not volatile without decomposition and cannot be distilled in steam from the raw materials in which they occur. On treatment with caustic alkali fatty oils, unlike others, form soaps. They are neutral bodies, and when pure are almost tasteless and odourless. Virtually insoluble in water and with the exception of castor oil, in cold alcohol, they are soluble in ether and petroleum spirit, and are mutually soluble, the one in the other. Since only fatty oils are digestible, they are the only fats to enter into human diet.

Chemically, fats and fatty oils are mixtures of mixed triglycerides, a triglyceride being a compound in which one molecular portion of glycerol is combined with three molecular portions of fatty acids, usually different ones. These acids are the saturated or unsaturated acids of the paraffin and allied series, and among the commonest are lauric, palmitic, stearic, and oleic acids. There is no chemical difference between a fat and a fatty oil, the term fat being reserved for such individual members as are solid, the term fatty oils for those which are liquid at ordinary temperature. The fat becomes fatty oil by heating, the change being reversed by cooling.

Fats occur throughout the tissues of animals and plants, form a homogeneous group, and are classified as follows: (a) animal fats, such as beef and mutton tallow and hog lard: these are derived from the fatty tissues of cattle, sheep, and pigs; (b) milk fats, such as butter fat and ghee: the former is derived mainly from the milk of the cow, the latter from that of the goat; (c) fish and marine animal oils: from the blubber of the large marine animals, such as the whale and the seal, from cod, herring, salmon, menhaden, and from the livers of halibut and cod; (d) vegetable oils and fats derived from fruit coatings and seeds of many plants and trees. The principal fruit coating fats are palm oil and olive oil, the principal vegetable seed oils being linseed, cottonseed, groundnut, soya, sunflower, rapeseed, coconut, with lesser amounts of palm kernels, sesame, hempseed, and castorseed. The oil content of these oilseeds varies: it is 63 per cent in the case of copra, 45 per cent in palm kernels, 15 per cent in soya beans.

World production of these fats and fatty oils is some 20 million tons a year, made up of three million tons of butter, four million tons of lard and tallow, 12½ million tons of vegetable fats and fatty oils, and 500,000 tons of marine animal and fish oils. Not all oil-bearing produce enters into world trade, a great deal being consumed in the countries of origin. This applies particularly to large quantities of soya beans, groundnuts, sunflower seed, sesame grown in China, to soya beans grown in Manchuria, to much of the oilseed crop in India, and notably to palm oil produced in W. Africa.

#### Countries of Origin

Soya beans are produced mainly in Manchuria, China, U.S.A.; cottonseed in U.S.A., Egypt, India, S. America, and Russia; linseed in U.S.A., Canada, India, Argentina; palm oil and palm kernels in W. Africa, Malaya, and the E. Indies; copra in India, Ceylon, Sumatra, Philippine Islands; sesame in India and China; groundnuts in China, W. Africa, India, U.S.A.; olives in Spain and other Mediterranean countries. Cod oil and cod liver oil come from Newfoundland and Norway; tallow from U.S.A., Argentina, Australia, New Zealand; while the main producing and exporting country of lard is the U.S.A.

Animal fats are produced generally by a process of rendering in

which the fatty material is heated in open kettles or closed autoclaves. Oilseeds and kernels, after shelling, crushing, grinding, and moulding of the resultant meal, are then subjected to hydraulic pressure between open plates or in enclosed cylindrical cage presses. A cold-pressed oil results; sometimes the residual cake is hot-pressed to remove further oil. The oil cake that remains, containing from 7 to 10 per cent of oil is used to feed cattle. Oils are also extracted from oilseeds and kernels by the use of a volatile solvent, preferably a petroleum fraction. In this case the residual meal may contain as little as 1 p.c. of oil; it is used in making compound feeding stuffs and in some cases as a fertiliser. However extracted, vegetable oils usually require filtering, refining, bleaching, and deodorising, particularly if they are to be eaten.

#### Uses of Fats and Fatty Oils

Fats and fatty oils are essential human food, the most important edible ones being: (1) butter, which exists in milk and is obtained by churning, and is usually taken raw; (2) lard, used in pastry and bread making and other cooking; (3) cacao butter, derived from the cacao bean and used in making chocolate and confectionery; (4) margarine (made from vegetable and whale oils), lard compounds, and shortenings; (5) vegetable oils (chiefly olive and cottonseed) used in frying.

Animal and vegetable fatty oils are used in soap making; hard soap is made by boiling tallow, palm oil, some hydrogenated fats, coconut oil, and such soft oils as cottonseed and soya bean oils along with resin and caustic soda. Soft soaps are made from linseed and cottonseed oils, caustic potash being used in place of caustic soda. In making hard soap, after removal of excess of alkali and separation of the soap, the resultant liquors contain weak glycerine, which is evaporated and refined to produce refined glycerine.

Fats can also be broken up into glycerine and their fatty acid constituents by treatment with super-heated steam, and in this way a better grade of crude glycerine is obtained, while the resultant fatty acids find an outlet in the candle, polish, and other industries. For the manufacture of toilet soaps and shaving soaps, high-grade tallow, bleached palm oil and coconut oil are preferred.

Linseed oil, China wood oil (Tung oil), perilla, and sometimes



soya bean oil are used in the making of paints and varnishes. These oils, usually termed drying oils, by absorption of atmospheric oxygen dry to a solid elastic skin; their drying is facilitated by first boiling the oils with small amounts of lead, manganese, and cobalt salts, known as driers. Rape or colza oil as an illuminant, though less common than formerly, is still important in regions of the world remote from supplies of kerosene, gas, or electricity. Oils from whale, seal, and cod are used in jute batching, in the treatment of textile fibres, and in leather dressing. Castor, cod liver, and chaulmoogra oils have long been valued for their medicinal properties; and castor oil is further of very considerable value in the manufacture of turkey red oil in the dyeing industry and as a lubricant in internal combustion engines. See *Essential Oils*; *Paint*; *Soap*, etc. Consult also *Oils, Fats, and Fatty Foods*, E. R. Bolton, 2nd edn., *Vegetable Oils and Oilseeds*, Imperial Economic Survey, 1938; *Utilisation of Fats*, H. K. Dean, 1938; *Industrial Fats and Waxes*, T. P. Hilditch, 2nd edn., 1941; *Review of the Oilseed, Oil, and Oilcake Markets*, Frank Fehr and Co., 1944.

H. M. Langton

**Faubourg**. French word for a suburb, e.g. the Faubourg St. Honoré in Paris. It comes from Latin words meaning outside the borough or burg, and in the days when cities had walls was given to suburbs outside them.

**Faucher**, LÉON JOSEPH (1803-54). French economist and politician. Born at Limoges, Sept. 8, 1803, he became prominent as a journalist, chiefly on *Le Temps* and *Le Courrier Français*, between 1830-42, making a close study of economic problems and exerting a moderating influence on the liberal factions. Elected a deputy in 1847, he was also returned to the constituent assembly of 1848 for the Marne dept. He was a strong advocate of free trade principles, influenced by a visit to England in 1843. Although minister of the interior in 1848-49, and again in 1851, his active political career was not successful, and he retired from public life in protest against the adoption of universal male suffrage in 1851. He was largely responsible for the foundation of the *Crédit Foncier* (q.v.) in 1852. He died Dec. 14, 1854.

**Fauchet**, CLAUDE (1744-93). French Revolutionist. Born at Dornes, Nièvre, Sept. 22, 1744, he

became a priest in Paris and tutor in a noble family. His preaching won fame for him, and after being dismissed from his position as court preacher he joined the Revolutionary party. He helped in the attack on the Bastille, and was afterwards a member of the legislative assembly and the national convention. He was made bishop of Calvados, but, ceasing to act with the advanced republicans, he was guillotined, Oct. 31, 1793.

**Faucille**, COL DE LA. Mt. and pass of France, in the dept. of Ain. They are in the Jura Mts., 16 m. N.W. of Geneva. On the summit of the mountain (4,355 ft.) are two hotels. The pass leads through the valley of the Dappes, which in 1862 was partitioned between France and Switzerland.

**Faucit**, HELENA SAVILLE (1820-98). British actress. She made her first London appearance at Covent Garden on Jan. 5, 1836, as Julia in Sheridan Knowles's *The Hunchback*, and achieved conspicuous success as Juliet, Portia, Constance, Desdemona, Imogen,



Helena Faucit,  
British actress

and Hermione. Macready engaged her as leading lady from 1837 at Covent Garden, The Haymarket, and Drury Lane. She acted Pauline to his Claude, Julie to his Richelieu, and Clara to his Alfred Evelyn, in the original production of Lytton's plays, *The Lady of Lyons*, *Richelieu*, and *Money*. In 1851 she married Sir Theodore Martin, who wrote her life, 1900. She died Oct. 31, 1898.

**Fauconberg**, BARON. English title dating from 1283 and now united with that of Conyers. Walter de Fauconberg, who was summoned to parliament as a baron in 1283, was the first holder, and the title passed to his descendants until it came in 1362 to Thomas, the 5th baron. He left an only daughter, Joan, who married Sir William Neville, and he, following the custom of the time, became Lord Fauconberg. He was made earl of Kent, but died without sons and from the time when his widow died (1491) to 1627 the barony was in abeyance. In that year Charles I gave Thomas Belayse the title of Baron Fauconberg, and in 1642 created him a viscount. To these titles his grandson Thomas succeeded in 1652. He was a parliamentarian and married Mary,

daughter of Oliver Cromwell. Afterwards he became a royalist and courtier under Charles II. He was made an earl in 1689 and died without sons in 1700. In 1903 the barony was granted to the countess of Yarborough, a descendant of Joan Neville.

**Fauldhouse**. Town of Scotland, in West Lothian. It is 7 m. S. of Bathgate and is served by two railway lines. Coal-mining, sand-quarrying, and the shale oil industry give employment. Pop. 4,941.

**Faulhaber**, MICHAEL VON (b. 1869). German prelate. This outstanding figure in the opposition of German clergy to the Nazi regime was born at Heidenfeld, Bavaria, March 5, 1869, and became a priest in 1892. He was professor at Strasburg university, 1903-11; bishop of Speyer, 1911-17; archbishop of Munich from 1917, cardinal from 1921. With historical learning and fearless spirit he early began to preach and write against Hitlerism, and his Christmas sermons of 1933-34, collected and published in many languages, became famous.

**Faulhorn**. Mt. of Switzerland, in the canton of Berne. It is in the Bernese Oberland, 32 m. S.E. of Berne, between the lake of Brienz and the Grindelwald valley. It is composed of calcareous, friable schist. Alt. 8,803 ft.

**Faulkner**, WILLIAM (b. 1897). American novelist. Born at New Albany, Mississippi, Sept. 25, 1897, he was educated at Mississippi university, and his first book, *The Marble Faun*, was published in 1924. Faulkner was strongly influenced by his southern environment; with many writers of his generation he was indebted to James Joyce, and his style was tortuous yet flexible. With *The Sound and the Fury*—considered his masterpiece—he established himself as one of the most important novelists of the American scene. Later novels, in which he used new methods of construction, included *Light in August*, 1932; *Absalom, Absalom*, 1936; *The Unvanquished*, 1938; *The Wild Palms*, 1939; *The Hamlet*, 1940; *Go Down, Moses*, 1942.



William Faulkner,  
American novelist

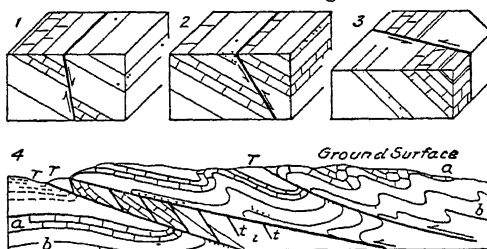
**Fault**. In geology, a fracture in the earth's crust along which the rocks on one side have been appreciably displaced relative to those

on the other. Faults are classified according either to their relation to the strata they traverse, or to the nature of the movement that has taken place. Thus dip-faults are parallel to the direction of dip of the strata which they cut; strike-faults are parallel to the strike or horizontal trend of the beds; and oblique-faults are between the two. The surfaces along which the movement has occurred are termed fault-planes; they are rarely vertical, and their inclination is measured either from the horizontal, when it is called the dip, or from the vertical, when it is called the hade. The upper surface of a fault-plane or zone is referred to as the hanging wall, and the lower as the foot-wall.

Where the rocks above the fault plane have moved downwards relative to those below it, the fault is said to be normal (Fig. 1). Where they moved upwards relatively, a reversed fault is produced (Fig. 2). When the inclination or dip of the plane becomes less than 45°, reverse faults are usually termed thrusts. Many big thrusts occur on planes which dip very gently and may be slightly undulating; the Moine thrust in N.W. Scotland is a classical example. Relative movement between the rocks above and below big thrusts associated with mountain building movements may measure tens of miles (Fig. 4). Tear-faults are faults on which the movement has been dominantly horizontal (Fig. 3). Numerous examples occur in the Scottish Highlands, where the Great Glen Fault, from Inverness to Loch Linnhe, is considered to have had a movement of 64 miles, in which the N.W. side moved S.W. relative to the S.E. side. The vertical component of fault movement is called the throw of the fault; the horizontal component is the shift.

Sudden movement on a fault sets up vibrations in the earth's crust and produces earthquakes (q.v.). Actual displacement of the ground surface by faults has been observed, the cliff so formed being called a fault-scarp. More common is the production of a cliff or slope feature along the fault by the erosion of softer rocks which have been thrown against harder. This

produces a fault-line scarp. Because faulting breaks up the rocks they are easily eroded along lines of faults; in this way fault-line valleys, such as the Great Glen are produced. Rift valleys are fault features formed by the sinking of a strip of ground between two parallel faults. Where rocks are broken into more or less cemented fragments a crush-breccia is formed; if this is ground to a clay it is called gongle. Faults sometimes form passages for ascending mineralised solutions, and so become the locus of ore deposition. They commonly act as channels for water, and the springs which occur along fault lines are



**Fault.** Diagram illustrating various types of geological fault. 1. Normal or gravity strike-fault. 2. Reverse strike-fault. 3. Transcurrent or tear dip-fault. 4. Section across a typical zone of thrusting. The beds a and b have been pushed upward and from the left on three subparallel major thrusts (T), and on repeated minor thrusts (t). The zone of minor reverse faulting is called a zone of imbrication (i)

of value for water supply. See Dip; Earth-movement; Tectonics.

Gilbert Wilson, Ph. D.

**Faunus** (Lat. *favere*, to favour). In Roman mythology, originally an Italian nature god, whom rationalistic explanations made out to be a prehistoric king. He was the patron of agriculture and of flocks and herds, and had prophetic powers. As the god of flocks, he was known as Lupercus, and the Lupercalia (Feb. 15) was celebrated in his honour. The Faunalia (Dec. 5) was rather a local festival. In art he is represented as a bearded man, with goatskin cape, and bearing a club and a horn.

**Faure, François Félix** (1841-99). French statesman. Born in Paris, Jan. 30, 1841, he made a fortune as a shipowner in Havre. He fought as a volunteer officer in the war of 1870-71 against Prussia, and entered the chamber as republican deputy for Havre in 1881. His knowledge of commercial and colonial conditions made him prominent, and he was under-secretary for the colonies in Jules Ferry's ministry of 1883, and minister of marine in 1894. He was elected president of the re-

public after Casimir-Périer's resignation, Jan. 15, 1895, defeating Brisson by 69 votes. An unsuccessful attempt on his life was made, July 14, 1896. The chief events marking his tenure of office were the visit of the tsar of Russia and the conclusion of the Franco-Russian alliance, 1896, and the beginning of the Dreyfus affair, at a critical point in which Faure died suddenly, Feb. 16, 1899.



**Félix Faure,**  
French statesman

**Fauré, Gabriel Urbain** (1845-1924). French composer. Born at Pamiers, Ariège, May 13, 1845, he studied under Niedermeyer and Saint-Saëns in Paris. His first appointment was that of organist at S. Sauveur, Rennes; after holding similar posts in Paris, he became maître de chapelle at the Madeleine in 1896. During 1905-20 he was director of the Paris conservatoire. It was here that his work as a teacher was accomplished, his pupils including Nadia Boulanger and Maurice Ravel. Apart from his Requiem which must be accounted a masterpiece, Fauré's reputation rests upon his songs and chamber music. Among his lyrics are *Après un Rêve*, *En Prière*, *Les Roses d'Ispahan*, the collections *Le Jardin Clos* and *Mirages*, and his settings of Verlaine, notably *La Bonne Chanson*. His two sonatas for cello, trio for violin, cello, and pianoforte, quartet for strings, and two quintets for pianoforte and strings are standard works. He died in Paris, Nov. 4, 1924. There are studies by C. Koechlin, 1945; N. Suckling, 1946. *Pron.* Fo-ray.

**Faure, Jean Baptiste** (1830-1914). French singer. Born at Moulins, Jan. 15, 1830, he excelled in singing as a boy. After studying at the Conservatoire in Paris, he appeared at the Opéra Comique in 1852, and achieved success in opera in Paris, London, Vienna, Brussels. He died Nov. 19, 1914.

**Faust.** German scholar of the 16th century whose name has become the centre of a great body of legend and poetry in European literatures. There is good historical evidence for the existence of a real doctor of this name who, during the first half of the 15th century, practised magical arts, and gained wide notoriety as a clever charlatan, especially, it is

believed, at Cracow. The numerous stories popularly attached to his name were collected anonymously and published by Johann Spiess at Frankfurt in 1587 as *The History of Dr. Johann Faust*, a book which went through many editions, translations, and adaptations. In this work the essentials of the story are given as follows:

Faust, weary of the pursuit of learning and worldly pleasures alike, has taken up the study of magic and necromancy. He conjures the devil, who engages to serve him in all he may desire for a period of 24 years, after which he passes into the devil's power. The devil accordingly procures for Faust all sorts of pleasures and supernatural aids to his study of sorcery, alchemy, and philosophy. Faust has occasional fits of repentance, which pass as his servant provides fresh delights; among his lovers is Helen of Troy, a familiar medieval incarnation of pagan delights. When the appointed time expires, Faust dies in an agony of fear, and falls irrevocably into the devil's hands.

#### The Legend in Literature

The Tragical History of Dr. Faustus, the drama by Christopher Marlowe, published in 1604, is the first appearance of the story in serious literary form in England. It was derived from an English version of the Spiess publication, published probably about 1590. Faust is depicted as a young man, enjoying to the full his ill-gotten pleasures; and the devil, Mephistopheles, is a genuinely tragic figure, fallen from heaven and tortured by regret for his lost state. Helen of Troy is conjured up near the end of the tragedy, symbolising the return of ancient beauty in the Renaissance to challenge medieval doctrines.

The Faust of Goethe, the greatest version of all, is a long verse drama in two parts. Beginning in 1773, Goethe did not complete working on it until 1832, a few days before his death, but parts were published in 1790 and 1808. The story is developed on widely different lines from the early Faust books. Faust, inspired by a fierce desire for knowledge and for pleasure, and convinced of the unreality and uselessness of his life, sells himself to Mephistopheles. He seduces and deserts the beautiful Marguerite, who in despair kills her child and is thrown into prison. Faust visits her, and tries, in vain to persuade her to flee with him, but she dies in his arms. A voice from Heaven declares that

penitence has saved the soul which he had imperilled. This is the central episode in the story, but the Prologue in Heaven describes how the temptation of Faust is undertaken by Mephistopheles as a wager with God, who believes that Faust can withstand his seductions.

In Goethe's second part, the philosophic aspect forms the exclusive interest, and the symbolism is often very obscure. Faust comes to the conclusion that neither learning nor bodily pleasures can satisfy his soul, but only a life of useful activity, contributing to the beneficent works of God and Nature. By this decision his soul is saved from perdition. Goethe has thus transformed the old Faust story, with its stress on the punishment awaiting those who seek human and rational knowledge in preference to theological doctrine, into an expression of the noblest humanism in thought and action.

Faust has also been the subject of a romance by Friedrich Klinger, 1791, of a dramatic poem by Nikolaus Lenau, 1836, and used as the basis for operas by Spohr, 1818, Berlioz, 1846, and Gounod, 1859. A tragedy, Faust, by W. G. Wills, based on Goethe's version, was produced successfully by Henry Irving at the Lyceum, London, Dec. 19, 1885, revived in 1888, 1894, and 1902. In 1920 the original version of Goethe's Faust, found by Friedrich Schmidt in a contemporary manuscript copy, was produced in Berlin by Max Reinhardt. Dorothy L. Sayers's play, *The Devil to Pay*, 1939, also dealt with the legend. *Pron.* Fowst. See Goethe; Mephistopheles; *Consult also* Johann Faust, The Man and the Myth, H. G. Meek, 1930.

**Faustina** (d. A.D. 141). Wife of the Roman emperor Antoninus Pius. His daughter of the same name (d. A.D. 175) married Marcus Aurelius, successor of Antoninus. Mother and daughter were noted for their profligacy, yet their memory was held in honour after their death by their husbands, who founded institutions for the educating of orphan girls called after them *Faustinianae*.

**Faust Up to Date.** Burlesque written by George R. Sims and Henry Pettit, with music by Meyer Lutz, produced Oct. 30, 1888, at The Gaiety, London, where it ran for 180 performances.

**Fauvism.** Art movement. The term *fauve*, wild beast, was applied in derision to a group of expressionist painters who first exhibited in Paris in 1906. Reacting against

the limitations of neo-Impressionism and all attempts at naturalism in art, the leaders influenced many of the younger painters of the day. Its adherents included Matisse, Braque, Vlaminck, Dufy, Van Dongen, and Friesz. Their work was characterised by broad patterns of decorative colour used in large, unbroken areas chained by heavy outlines. In their revolt against academic influences the Fauvists turned to negro art.

**Fauxbourdon.** Musical term denoting a system of vocal harmony which in its simplest form consists of a chain of first inversions, beginning and ending with a chord in root position, i.e. bass, fifth, and octave.

**Favara.** Town of Sicily, in the prov. of Agrigento. It stands at an alt. of 1,100 ft., 5 m. S.E. of Agrigento and 9 m. from the Mediterranean. It is the centre of a fruit-producing district, and is noted for its rich sulphur mines; other products are marble, alum, and tourmaline. There is a 14th cent. castle of the Chiaramonti. Pop. 21,599.

**Favart, CHARLES SIMON** (1710-92). French dramatist. Born in Paris, Nov. 13, 1710, he produced his first light opera, *Les Deux Jumelles*, in 1734, with such success that he left his father's bakery business and turned to playwriting. Under his direction the Opéra Comique became the centre of this class of work for many years. A protégé of Madame de Pompadour, he scored other notable successes with *La Chércheuse d'Esprit*, 1741; *Les Moissonneurs*, 1747; *Les Trois Sultanes*, 1761. His wife, Marie Justine du Roncerai (1727-72), was a celebrated actress, whose coldness to the enamoured Marshal de Saxe, when the Favart company was performing in his camps in Flanders, 1747, brought his wrath on her, and a *lettre de cachet* on her husband, the execution of which he escaped. Favart died in Paris, May 12, 1792.

**Faversham.** Mun. bor. and market town of Kent, England. It stands on a branch of the Swale, called Faversham Creek, and is 9½ m. N.W. of Canterbury, with a railway station. In 1147 Stephen and Matilda founded here a Cluniac abbey, of which traces



Faversham arms

still exist. In it the royal pair and their son Eustace were buried. The cruciform church of S. Mary of Charity, in the Early English style,

restored by Sir G. G. Scott in 1874, contains some superb brasses.

Faversham has a trade in fruit, hops, and agricultural produce, also powder mills, brickworks, breweries, a canning factory, and an oyster industry. The port has a trade in coal, timber, etc. The corporation owns a recreation ground and cemetery. The town is a parl. div. of Kent. Owing to its position at the point where Watling Street touched the river, Faversham was probably an important place in Roman Britain, certainly in Anglo-Saxon times. It was a member of the Cinque Port of Dover, and was governed as now, by its own mayor and corporation, while its abbot was rich and powerful. Market days, Wed. and Sat. Pop. 12,000.

**Favignana** (anc. *Aegusa*). Island of the Mediterranean, belonging to Italy. It lies off the N.W. coast of Sicily, and, covering 8 sq. m., is the largest of the Aegades Islands. Favignana, the chief town and fishing port, lies on the N. shore, and has a fortified harbour. Off the island the Carthaginian fleet was defeated by the Romans in 241 B.C. The island is 6 m. long, and rises over 1,000 ft. It is honeycombed with caves.

**Favonius**. In Roman mythology, the name of the W. or S.W. wind which blew in spring, identified with the Greek Zephyrus.

**Favorinus**. Greek sophist and rhetorician. A native of Arelatē (Arles) and a great traveller, he flourished during the reign of Hadrian. He wrote several miscellaneous works, but none survives.

**Favre, Jules Claude Gabriel** (1809–80). A French statesman. Born at Lyons, March 21, 1809, he entered the legal profession, and, an ardent republican from the first,

was elected deputy for Lyons to the constituent assembly, 1848. A bitter enemy of Louis Napoleon, he attempted an armed riot against his election to the

presidency, 1851; defended his assailant Orsini, 1858; led the republican opposition in the chamber, 1863–70; and founded the republican paper, *L'Électeur*, 1868.

In the government of national defence, 1870, Favre was foreign



Faversham, Kent. The parish church of S. Mary of Charity, restored in 1874

minister and vice-president, but mismanaged the armistice negotiations, Jan. 28, 1871, and as foreign minister under Thiers, 1871, was easily out-manoeuvred by Bismarck. The treaty of Frankfurt brought about his resignation, July 23, 1871. He was elected to the senate in 1876, and died Jan. 20, 1880.

**Favus** (Lat., honeycomb). Disease caused by a parasitic fungus, of the genus *Achorion*, which most frequently attacks the scalp, but may affect any part of the skin. Favus is common in Eastern Europe and Asia, but is rare in Great Britain. On the scalp it first appears as small, irregular cups of a sulphur-yellow colour. Large scabs are gradually formed which eventually drop off, leaving a depressed scar destitute of hair. Favus of the nails somewhat resembles ringworm of the nails. The condition is intractable, and may persist for years. The contagion may be derived from rabbits, dogs, fowls, and other animals. Exposure of the patch to X-rays, followed by vigorous treatment with antiseptics, gives the best results.

**Fawcett, Henry** (1833–84). A British politician. Born at Salisbury, Aug. 26, 1833, he graduated at Cambridge in 1856, distinguishing himself in mathematics. He was accidentally blinded at a shooting party in 1857, but, taking up his fellowship at Trinity Hall, devoted his time to the study of political economy, of which he became professor in 1863. In 1867 he married Millicent Garrett, a distinguished advocate of women's rights. In 1865 he became Liberal

M.P. for Brighton. Identifying himself with schemes of reform and devoting himself especially to all questions concerning India, he became known as the member for India. In 1875 he was elected M.P. for Hackney, and in 1880 became postmaster-general under Gladstone, but without a seat in the cabinet. He introduced several postal reforms. He died at Cambridge, Nov. 6, 1884. *Consult* Life, L. Stephen, 1885; A Beacon for the Blind, W. Holt, 1926.

**Fawcett, Dame Millicent Garrett** (1847–1929). A British writer and feminist. Born June 11, 1847, at Aldeburgh, she was the sister of Elizabeth Garrett Anderson. In 1867 she married Henry Fawcett (*v.s.*). She became a leading advocate of women's suffrage as president of the national union of women's suffrage societies until 1919. Her two text-books, *Political Economy for Beginners*, 1870, and *Tales in Political Economy*,

1875, had great popularity. She wrote *Essays and Lectures*, jointly with Henry Fawcett, 1872; *Life of Queen Victoria*, 1895; *Women's Suffrage*, 1912; *What I Remember*, 1925. Created D.B.E. in 1925, she died Aug. 5, 1929.

**Fawcett, Percy Harrison** (1867–?). English explorer, born at Torquay, Aug. 31, 1867. He commanded a brigade of artillery in the First Great War. In 1922 he led an expedition into the unexplored heart of Brazil, and two years later made with his son a second journey to the district, being last heard of in 1925. Several expeditions went in search of Fawcett, and although he was generally presumed to be dead, reports were circulated for some years that he was living with the Ana-fuqua Indians. *Consult* Man Hunting in the Jungle, G. M. Dyott, 1930.

**Fawkes, Guy** (1570–1606). English conspirator, central figure in the Gunpowder Plot. Born at York, April 16, 1570, he served for some years with the Spanish armies in the Low Countries from 1593.



Henry Fawcett, British politician



Millicent Garrett Fawcett



Jules Favre, French statesman

In 1604 a small group of Roman Catholic zealots, finding that they had nothing to hope from the accession of James I, formed a plot for the overthrow of the government by blowing up king, ministers, and parliament together; in the resultant chaos, the Roman Catholics, headed by the conspirators, were themselves to seize the government. The secret, imparted to few—Catesby, Percy, Digby, Rookwood, and Tresham are the most familiar of the names of the plotters—was for a long time well kept. The design was to be carried out on the day of the assembling of parliament in Feb., 1605. But the meeting was adjourned till Oct., and finally till Nov. 5. The conspirators procured an adjoining house which gave them access to the chambers under the Parliament House, where gunpowder was stored, while the execution of the plot was entrusted to Fawkes.

#### Betrayal of the Plot

But at the critical moment a hint was conveyed by one of the conspirators, Francis Tresham, to Lord Montague, warning him to absent himself from the ceremony, since "this Parliament shall receive a terrible blow, and shall not know who hurts them." The meaning of the hint was unexpectedly elucidated; on the night of Nov. 4 Fawkes was found at his post, and was seized after a desperate resistance. The rest of the conspirators fled, but were hunted down and captured or slain. A full confession was extorted under torture from Fawkes, who, with the surviving conspirators, was executed, Jan. 31, 1606.

The share taken in the affair by the Jesuits is a matter of dispute, but two of them, Gerard and Garnet, the head of the order in England, certainly knew of the plot, though the latter is said to have received his information only under the seal of confession. The effect of the plot was to establish in the minds of the English people an unreasoning and persistent fear and hatred of the Roman Catholics; though none but a few desperate fanatics had been concerned.

**Fawn.** The young of a deer; strictly a calf, either buck or doe, of the first year. See Deer.

**Fayal** or **FAIAL.** Island of the Azores, belonging to Portugal. It lies W. of Pico and covers 65 sq. m. Almost wholly mountainous (highest point, 3,300 ft.), it is fertile, cereals, fruit, and vegetables being cultivated. The fig tree flourishes, and from its pith carvings are

made; lace is made from the agave. Basket-making is carried on, but the so-called Fayal wine was made in the neighbouring island of Pico. The capital and chief port is Horta. Following the agreement with Portugal, Oct. 12, 1943, whereby Great Britain was granted temporary facilities in the Azores, the R.A.F. maintained a radar station near Horta. That port was also used by the R.N. as a base for warships engaged in escort and anti-submarine duties in the Second Great War.

**Fayalite.** An orthorhombic mineral, silicate of iron ( $\text{Fe}_2\text{SiO}_4$ ). It is one of the end-members of the olivine group, ranging from pure forsterite,  $\text{Mg}_2\text{SiO}_4$ , to pure fayalite,  $\text{Fe}_2\text{SiO}_4$ . Fayalite has been suggested as the name to cover members of this series containing 10 p.c. of the forsterite molecule. See Olivine.

**Faye**, **HERVÉ AUGUSTE ÉTIENNE** (1814-1902). French astronomer, born at St. Benoît-du-Sault, Indre, Oct. 5, 1814. He was made professor of astronomy at Nancy in 1854, and in 1873 professor of astronomy and geodesy at the École Polytechnique in Paris. He discovered the comet named after him, Nov. 22, 1843. It has a period of  $7\frac{1}{2}$  years, and pursues the most nearly circular path of any known object of the kind. His name was associated with the cyclonic theory of sunspots, with the nature of, and velocities in, prominences. He died in Paris, July 4, 1902.

**Fayum** or **FAIYUM** (Coptic, lakeland). Prov. of Upper Egypt. It contains the districts of Etsa, Fayum, and Senures. The district of Fayum consists of a nearly circular basin, well irrigated and fertile, sunk below the level of the surrounding desert. In it are Lake Moeris and the town of Medinet-el-Fayum (pop. 63,703). The chief products are rice, cotton, flax, hemp, figs, olives, and oranges. The prov., which is watered by the Bahr Yusuf, an old Nile branch, abounds in ancient remains, its sites having been dug by Flinders Petrie between 1888-90. The area of the prov. is 670 sq. m. Pop. 602,122.

Its overflow was embanked by Amenemhat III, who built a funerary temple, known in ancient times as the Labyrinth, two colossal statues on limestone pedestals, and the Hawara pyramid. Adjacent Roman tombs have furnished many mummy-portraits. Senwosri II erected the Illahun pyramid. At Gurob pre-

cious papyri were recovered from mummy-wrappings; other papyrus collections have come from Arsinoë and elsewhere.

**Fazogli** or **FAZOKL.** Region of the Anglo-Egyptian Sudan. It is intersected by the Blue Nile and borders Abyssinia on the S. and E. The inhabitants are negroes, but there are Arab settlements. The chief town is Famaka. Gold, ivory, gum, and fruits are exported, and tobacco and durra are produced.

**Feale.** River of Eire. Rising in N.W. co. Cork, it passes N.W. between cos. Limerick and Kerry and thence W. through Kerry to the Shannon, which it enters as the Casheen. Its length is 37 m.

**Faalty** (Lat., *fidelitas*, faith). Feudal vassal's fidelity to his lord. Under the feudal system the oath of fealty was taken by every tenant or vassal and bound him to be faithful to his lord. It corresponded to the oath of allegiance taken to the king. After the break-up of the feudal system fealty was often commuted for a money payment. Fealty was abolished in 1922.

**Fear** (A.S. *fæor*). An emotion roused by the presence or expectation of danger. In animals it prompts to immobility, flight, or attack; in reasonable men, to conduct which will remove the source of fear. In its extreme form—panic—reason loses control and blind instinct sweeps over all, in which state men will rush into situations of greater danger. In the form known as anxiety, fear is the most important of all emotional forces, far-reaching and devastating. Fear of doing wrong, of disapproval and punishment, human or divine, are the strongest instigators of moral conduct. On the other hand strong fear clouds judgement and produces morbid consciences and irrational feelings of guilt, while fear for personal safety is the cause of many crimes. If prolonged and acute, anxiety may become unbearable and must be repressed. When this occurs it accumulates in the unconscious and gives rise to morbid states which vary between physical illness, a chronic tendency to worry, and neurosis.

Fear is attended by marked physical reactions. Adrenalin is poured into the blood, the action of the heart is quickened, and blood may rush to it with such violence as to cause death, the hair rises; the subject sweats, stares, and pants; sight and hearing become more acute. See Emotion.

**Fear.** A cape or headland of North Carolina, U.S.A. Extreme S. point of Smith's Island and of the state. It has a lighthouse.

**Fearon, P. H.** British cartoonist, whose career is described under Poy, his pseudonym.

**Feast.** Term applied to days on which notable events in Church history, giving occasion for solemn joy, are commemorated. An Act of Edward VI prescribed certain days only to be kept as feast days, and a list of those now observed appears in the Prayer Book. From this has developed the use of the word for occasions of rejoicing in public or private; for public dinners, *e.g.* mayoral or civic feast, etc. Certain feast days, *e.g.* Michaelmas, are used in connexion with tenancy and other agreements. See Easter.

**Feather.** Outgrowth of the skin in birds. In the developing bird embryo the skin is thrown into folds which run in certain patterns. These folds become interrupted, but at the points where they persist growth continues and produces series of thimble-like outgrowths (Fig. 1), the pterylae or rows of feathers. The individual outgrowths are the



Feather. 1. Thimble-like outgrowths from which feathers grow

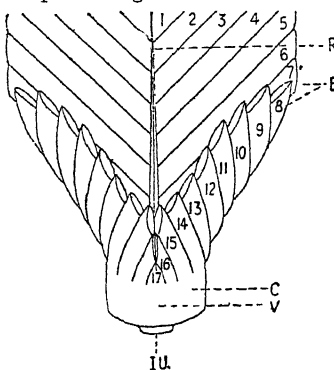
feather-germs. These thimbles of ectoderm placed upon fingers of mesoderm produce the feathers by simple direct growth. Each sinks from the surface and comes to occupy the bottom of a depression called the follicle (Fig. 2). Growth of the bottom of the thimble pushes out a hollow cylinder of ectoderm, the mesodermal core dying away at its tip as growth proceeds. Upon the inner side of this hollow cylinder there develop pleats like those in a kilt. These all begin on the side of the cylinder towards the rear of the bird.

As this side is beneath the anterior side because the feather slopes backward, it is called the



Feather. 2. The bottom of the follicle

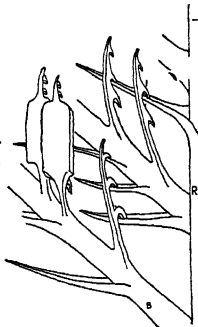
ventral side; that opposite is the dorsal side. As growth continues, these pleats do not run straight down the cylinder, but take on a half-spiral form. Each just fails to reach its opposite number on the dorsal side. The strip running down the dorsal



Feather. 3. The definitive feather. B (1-17), barbs of definitive feather vane, serially numbered in order of development; C, collar; IU interior umbilicus; R, rachis of definitive feather; V, ventral

side where the pleats fail to meet is called the rachis or central rib of the feather. The pleats are called the barbs. All the ectodermal cells concerned in this process become loaded with keratin or horn and die. The cylinder splits down the ventral side and the dead horny structure opens out as the definitive feather (Fig. 3). The barbs are held together by barbules in the form of hooks and troughs indicated in Fig. 4.

In the peacock and some other birds some of the backs of these barbules are iridescent. In most birds which are not white the cells out of which the feather is made become loaded with melanin, a colouring matter supplied to them in grains by special cells. The production or supply of these grains is in many forms affected by the sexual hormone of the female, though not by that of the male. This accounts for some of the differences in colour between



Feather. 4. The barbs held together by barbules in the form of hooks and troughs. B, barbs; R, rachis

the sexes in birds. If female hormone is given to a brown Leghorn capon the breast feathers growing at that time are coloured in the light female way instead of the dark male way. A small dose gives a short duration of the effect and so a narrow bar of female colour (Fig. 5).



Feather. 5. Narrow bar of "female" colour

Feathers are also usually coloured by carotene pigments. A few parrots have a yellow pigment that fluoresces in ultra-violet light, so that they look uncannily bright. Plant-eaters (*g.v.*) have a pigment which, being water-soluble, washes out in heavy rain. Budgerigars exhibit the Tyndall effect having black cores to the barbs which absorb the long wave light while the short wave light is scattered back by the keratin, which has variations of refractive index in it and encloses air of a refractive index different from that of any keratin. The resulting colour is blue or green. White feathers are white as a limiting case of this scattering effect.

**Feather.** Term used in connexion with the adjusting of an oar, ship's propeller, or airscrew so that it offers the minimum resistance to water or air. In rowing, feathering is done by turning the blade of the oar horizontally as it leaves the water. The blades of a ship's propeller are so feathered or set in the boss that they offer the minimum resistance to the water as the leading edge of the blade moves forward with the revolution of the shaft, but exert the maximum grip in the water; the trailing edge of the blade is set so that the water slips off the blade with the minimum of resistance. On paddle-steamers the float boards of the paddles are feathered by fitting them so that they turn on an axis to present their broad side to the water at their lowest submergence, but turn their edge to the water on entering or emerging.

Airscrews are feathered to overcome the phenomenon that a propeller does not pull an aeroplane along equally well at all heights. If it is most efficient at 1,000 ft., its thrust will be much less at



30,000 ft. The feathering or variable pitch airscrew enables the angles of the blade to be altered in relation to the axis of the propeller boss while the aircraft is in flight and so maintain maximum thrust. A feathering airscrew enables the pilot to get the maximum pull from the airscrew when taking off. In aeronautics, feathering is akin to gear-changing on a motor car, enabling the aircraft to make the best use of its propeller at varying speeds and heights. In certain feathering airscrews the alteration in the pitch of the blades is effected automatically by the engine in conjunction with a governor; in other types a small reversible electric motor is fitted into the propeller boss, the degree of feathering, or pitch variation, being indicated by a dial on the instrument panel. *See* Airscrew.

**Feather.** River of California, U.S.A. Rising in many headstreams in the Sierra Nevada range, it flows S.W. and S. to the Sacramento river about 15 m. above Sacramento city. Over 230 m. long, it is navigable for 30 m. It was in the "gold rush" area, 1849.

**Feather Grass** (*Stipa pennata*). Perennial grass of the family Gramineae. A native of Europe, it was long cultivated in gardens as an ornamental plant. The glume containing the seed is covered with stiff hairs pointing upwards, whilst its base terminates in a sharp point. Above it is continued as a long, spirally twisted awn, ending in a long feather-like tail. The wind acting on the glume detaches the seed, etc. from the plant, and when it reaches the earth the spiral, by expanding in dry and contracting in wet weather, forces the seed into the ground, the bristles on the glume allowing it to enter but preventing its return. If these seeds get into the fleece of sheep they are driven by the same mechanism into the flesh of the animal. Two allied species, *S. capillata* (Russia) and *S. spartea* (N. America), are known to kill sheep in this manner.

**Feather Star.** Class of the Echinodermata (*q.v.*), otherwise known as sea lilies. They resemble very slender starfish, with long rays bearing little branches or pinnules, somewhat like feathers. They live in deep water. Only one species, the rosy feather star, occurs around the British coasts. *See* Crinoidea.

**Featherstone.** Urban district and parish of the West Riding of Yorkshire. It is 2 m. W. of Pontefract, with a rly. station, and is a

coal mining centre. The place is specially known because, during a strike, there was a riot here, Sept. 7, 1893. Colliery works having been destroyed, the military arrived, and order was not restored without bloodshed. Pop. 14,952.

**Featherweight.** Literally a weight absolutely exact, so much so that the addition of a feather would make it wrong. The term is used in racing for the lightest weight that can be carried by a horse in a handicap race. In boxing it refers to the lightest class but two of competitors in a recognized competition; a featherweight boxer must not exceed 126 lb. in weight. *See* Boxing.

**Febrifuge** (Lat. *febris*, fever; *fugare*, to put to flight). Term used for any medicine that lessens fever. Antipyrrin and phenacetin are febrifuges, as are substances that induce sweating. Fever is now recognized as often a beneficial reaction to invasion of disease, and is allowed to run its course. If it is too high, cool sponging is preferable to drugs.

**Febris.** In Roman mythology, the personification of fever, also the goddess who was supposed to avert it. Three temples in Rome, one on the Palatine, were sacred to her.

**Febronianism.** Reform movement among the Roman Catholics of Germany. It was started in 1763 by Johann von Hontheim, who wrote under the name of Justinus Febronius. Its object was to limit the autocratic power of the pope and to secure a larger measure of independence for national churches.

**February.** Second month of the Christian calendar, ordinarily consisting of 28 days, but in leap year of 29. The name comes from Latin *februare*, to purify, in allusion to the Lupercalia (*q.v.*), the Roman expiatory festival, which, as well as the Feralia, or general festival of the dead, was celebrated in Rome during this month. The month is popularly known as

February "fill-dyke," referring to the melting of the winter snows. January and February were additions to the old Roman calendar. *See* Calendar.

**Fécamp.** Town and seaport of Normandy, in the dept. of Seine-Inférieure, France. It stands on the English Channel, at the mouth of the river Fécamp, 28 m. N.N.E. of Havre. The port, which has a harbour and docks, has a trade in coal, timber, etc.; it is also a fishing centre. There are some industries, mainly shipbuilding, and here is made the liqueur called benedictine. A commercial broadcasting station before the Second Great War attracted British listeners.

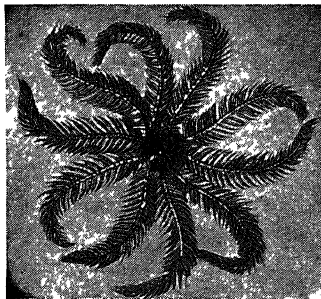
The most interesting building is the church of the Trinity, built in the 12th century, once the abbey church. A magnificent building, it has a spacious and noble interior, fine memorials and decorations, tombs, stained glass, etc. S. Étienne is a 16th century church, while the remaining monastic buildings are now used for the town hall, library, and museum. The town grew up around a nunnery founded in the 7th century to hold a relic of the True Blood, which was washed ashore in the trunk of a fig tree. The name may be a corruption of *fleus campus*. Pop. 16,876.

**Fechner, GUSTAV THEODOR** (1801-87). German philosopher. Born near Muskau, Prussia, April 19, 1801, he was professor of physics and afterwards of philosophy in the university of Leipzig. The founder of psychophysicism, he held that all mental changes were accompanied by a parallel change in the nervous system. His chief scientific works are *The Supreme Good*, 1846, and *Elements of Psychophysics*, 1860. Fechner was also the author of satirical writings under the name of Dr. Mises. He died Nov. 18, 1887. *See* Psychophysics.

**Fechter, CHARLES ALBERT** (1821-79). British-French actor. Born in London, Oct. 23, 1824, he was a sculptor before he went on the French stage in 1844. He soon became recognized as the leading French *jeune premier*, notably by his Armand Duval in Dumas fils' *La Dame aux Camélias*, 1852. He appeared at The Princess's, London, Oct. 27, 1860, as Ruy Blas in



Gustave Fechner,  
German philosopher



Feather Star. Specimen of rosy  
feather star, *Antedon bifida*

a version of Hugo's play, with great success. His Hamlet was enthusiastically received; but his Othello proved disappointing. Lessee of The Lyceum, 1863-67, he played in melodramas, such as The Corsican Brothers. He finally left England in 1872, remaining in America until his death, Aug. 5, 1879. It was Fechter who presented Charles Dickens with the chalet at Gad's Hill in which much of the novelist's last work was done.



*John Fechter*

**Feckenham, JOHN** (c. 1515-84). An English ecclesiastic. Born at Feckenham, near Droitwich, he became a Benedictine monk at Evesham, and then was rector of Solihull. He was confined in the Tower by Cranmer, 1549-53. When Mary restored the monastery of S. Peter at Westminster, he was chosen abbot. At the accession of Elizabeth he refused to acquiesce in the reformation of the Church, opposing the new liturgy and the Act of Uniformity, 1559. The monastery was later dissolved and Feckenham lived in confinement at London and Wisbech until his death, Oct. 16, 1584.

**Feddān.** Modern Egyptian land measure. The feddan is 1.038 acres, but in certain localities it is equivalent to 1.127 acres, whilst formerly it equalled as much as 1.266 acres. The measure is divided into 24 kirats.

**Federal Bureau of Investigation.** Detective service of the United States department of justice established in 1908 for investigating violations of the law. The F.B.I. is concerned with crime as it affects the U.S.A. as a whole, as distinct from individual state offences which are the responsibility of the local police. It is the authority in enforcing the laws relating to white slave traffic, theft of motor vehicles, blackmail, racketeering, and kidnapping. During the Second Great War the F.B.I. was responsible for counter-espionage, combating sabotage, and coordinating the search for escaped prisoners of war. It maintains forensic laboratories and an identification department with some 100,000,000 fingerprints, normally added to at the rate of 7,000,000 a year. The investigating staff of the bureau are popularly known as G-men (*q.v.*).

**Federalism** (Lat. *foedus*, a league). Form of government. The federal form of government involves limitations upon the power of the central government of a sovereign state, and fairly large units of subordinate government. Thus a federal state is distinguished from a confederation of states in having a powerful, though limited, central government; and federal units are distinguished from units of local government in being large and controlling elements in the governmental organism.

Federation means either the character of the government in a federal state, or the political movement towards decentralisation; and thus it may be best explained by reference to the practice of federal governments. Such governments may be formed either by the unification of diverse units, as in Switzerland and the original United States of North America, or by decentralisation of a single unit of government, as in Canada. The federal states of South and Central America vaguely reflect both methods of formation.

The subordinate elements in a federation are sometimes called states, as in N. and S. America, and sometimes called by other names, *e.g.* cantons in Switzerland. The idea of subordination, however, is not quite adequate, for the distinction between the functions of central and non-central government in a federal state is not one between a superior and an inferior. The distinction is based on a division between equally important functions.

The non-central governments generally deal with industrial issues of a localised character, with education, with taxation or a large part of it, with roads and summary justice; the central governments deal with peace and war, foreign or international affairs, basic administration of justice, and communication. Clearly the way in which the functions are divided must vary with the peculiar circumstances or the history of the people concerned, and where there is an increase of governmental functions there may be disputes as to the competence in particular issues of the central and the non-central governments.

**Bibliography.** History of Federal Government, E. A. Freeman, 1863; Federation in Central and Eastern Europe, R. R. Schlesinger, 1946.

**Federalists.** American political party formed in 1787. When the thirteen British colonies of N. America were recognized as an in-

dependent nation in 1783, the most urgent problem before them was the provision of a common central government which at the same time should not interfere with the autonomy of the several states. The practical result was that politicians were grouped into two parties with an indefinite line of demarcation—the Federalists, who emphasised the necessity for strengthening the authority of the central government, and the anti-Federalists, who emphasised the rights of the individual states. Since the individual interests of the northern states clashed with the individual interests of the southern states, while if representation rested upon population and wealth the north would dominate the central government, the northern politicians became roughly identified with the Federalists, the southern with the anti-Federalists.

Washington, as president, did not wish to identify himself with a party; Hamilton, the leading Federalist, and Jefferson, a prominent anti-Federalist, served under him in the same government. But at bottom the real question was whether the interests of the N. or those of the S. should predominate. The series of presidents from Jefferson onwards were anti-Federalists—mainly a consequence of want of solidarity among the Federalists and of the popular anti-British policy of the anti-Federalist statesmen. The Federalist party broke up and disappeared after the "Hartford Convention," which was held by the Federalist states of New England in 1814, with the somewhat paradoxical aim of organizing defence against encroachments upon the rights of the northern states, while it was strongly suspected of aiming at the separation of the New England states. See United States: History.

**Federal Reserve.** Banking system of the U.S.A. Each of 12 Federal Reserve banks established in 1913 under control of the F.R. Board acts in the separate district assigned to it as a central bank; thus together the banks maintain the ultimate reserves of the majority of the 15,000 separate banks which serve the U.S.A. and coordinate the operations, within limits, of commercial, state, and national banks. They are bankers also to the government, which appoints members to the central board; issue legal tender notes, which circulate along with those issued by the U.S. treasury; and by means of their lending facilities do much to ensure the stability

of the U.S. banking system, especially in times of crisis. Reserve banks must maintain reserves of 35 p.c. in lawful money against their deposits and 40 p.c. in gold against notes.

**Federal Union.** Name given to a movement to establish a federation among the democratic countries of the world as a preliminary to a world federation. A society was established in London in 1939 under this name. It was proposed to form a federation of Great Britain, the U.S.A., France, Belgium, the Netherlands, Sweden, Norway, Denmark, Finland, Switzerland, Canada, Australia, South Africa, New Zealand, and Eire. The union was to have a constitution modelled on that of the U.S.A., constituent states retaining a considerable measure of autonomy. Clarence K. Streit, president of Federal Union, Inc., was the principal publicist of the movement.

**Federated Malay States.** Name formerly given to a federation of native states of Malaya. See Malaya, Federation of.

**Federation of British Industries.** A British association of manufacturers, founded in 1916 and incorporated by royal Charter in 1923. Its purpose is to formulate and voice considered views on matters of industrial policy; and to assist in day-to-day problems affecting the production and sale of British manufactured goods. The F.B.I. represents some 250 trade associations and 4,600 individual firms, and has district offices in all parts of the Empire and many foreign countries. The headquarters are at 21, Tothill Street, Westminster S.W.1

**Fee.** Payment made for services, especially of a professional kind. The fees of doctors, lawyers, architects, and others are usually settled by custom, although as regards solicitors a maximum scale of fees is fixed by the Law Society. The fees of barristers, being originally honoraria, are not recoverable in a court of law. Fees vary considerably, more especially those of medical men and lawyers. Those of architects, surveyors, and the like are generally arranged on a percentage basis. The charge made for entrance to societies, clubs, etc., also the right to sit at examinations, is called a fee, as is the terminal payment to an educational establishment. See also Fee Simple.

**Feed.** Mechanical device for automatically conveying materials to a machine, fuel to an engine, or ammunition to a gun. Typical

feeds to a machine are the shuttles used in mechanical weaving, the rollers carrying metal strip to stamping machines such as those used for making coins and buttons, and the paper reels which feed printing presses. Fuel feeds include the pump which conveys petrol from the tank to the carburettor of an internal combustion engine, and the mechanical stoker which conveys solid fuel to a furnace. Ammunition feeds on heavy artillery usually consist of a tray which, lying below and to the rear of the breach, receives the shell and is then mechanically raised so that a hydraulic rammer can push the rounds into the breech. Automatic weapons of the Vickers machine-gun type are fed by a belt which, actuated by the recoil mechanism of the gun, carries the rounds into the breech. Guns of the Bren and Sten type are fed from fixed magazines, a spring in the base of the magazine feeding the rounds into the breech.

**Feeder.** Conductor which carries an electric current from one point to another; from generating station to sub-station, or sub-station to distribution centre or consumer; usually without intermediate connexions, in which it differs from a distributor cable which has service connexions tapped off.

**Feeding Stuffs.** Foods for farm livestock. They can conveniently be classed as: *coarse fodders*, which include hay, straw, and chaff, all bulky materials characterised by a high proportion of indigestible fibre; *green fodders*, e.g. grass, lucerne, sainfoin, clovers, vetches, marrow-stem kale, green maize, rape, and mustard; *succulent foods* including turnips, swedes, mangolds, and potatoes, which contain a high proportion of water and a low amount of fibre—dry matter in the succulent foods varies from about 25 p.c. in sugar beet to 9 p.c. in some turnips, almost two-thirds of it in the form of readily digestible sugar; *concentrated foods*, so called because they contain a high feeding value in a much smaller bulk than in the previous classes of foods. A series of *special feeding stuffs*, yeast, dried blood, meat meal, etc., is used for feeding swine.

The manner in which feeding stuffs of all description are utilised in practice is determined by their chemical composition, their digestibility, and the peculiar requirements of the animal to which they are fed. Thus, apart from the maintenance of the heat and

functions of the different organs of the body and the repair of tissues thereby involved—a requirement common to all animals—the use of every food is based on its value for beef production, milk production, the fattening of sheep, lambs, and swine, and the extent to which it supplies vitamins and, finally, mineral ash.

Coarse fodders may be regarded as sources of maintenance requirements; they also furnish the bulkiness without which the stomach is not sufficiently distended to promote the easy flow of gastric juices. Green fodders supply a readily digested proportion of carbohydrate matter and water in a form especially valuable to milch cows. Concentrated foods individually supply the three essential food constituents, protein, fat, and carbohydrates, in a relatively small bulk. Linseed cake and cotton cake contain each about 10 p.c. oil and respectively 30 and 40 p.c. protein. Leguminous seeds which, unlike the two cakes just mentioned, are used without previous processing for the extraction of oil, all possess a fairly high protein content but are low in oil and high in carbohydrates. Soya bean is an exceptional seed, rich in both protein and oil, the figures of which are 33 and 18 p.c. respectively. Of the cereals, wheat and barley contain approximately half as much protein as is found in peas and beans; they are low in oil but rich in carbohydrates. Oats (unhusked) contain as much protein as wheat and barley but much more oil and less carbohydrates. Despite the high proportion of fibre in oats, they constitute one of the best balanced foods for all classes of livestock. Maize contains more oil than wheat or barley and about the same amount of protein, but is distinctly low in ash.

**LAWS OF SALE.** Under the Fertilisers and Feeding Stuffs Act, 1926, and regulations made thereunder, every person who sells as a fertiliser for the soil or as food for cattle or poultry any of the articles set out in the Act must supply the purchaser with a statement in writing containing the name under which the article is being sold, particulars as to its nature, substance, and quality and (for feeding stuffs) whether it contains certain specified ingredients. In certain cases this does not apply to sales in quantities of 56 lb. or less. The seller warrants that the particulars in the written statement are correct and when

certain feeding stuffs are sold for use as food for cattle or poultry further warrants that the stuff is suitable for that purpose. If either of these warranties is broken the seller may be sued for damages.

**Feeling** (A.S. *felan*, to feel). Term used in various senses in psychology; especially for that aspect of the mind which includes pain and pleasure, tension and relaxation, and the emotions. In this sense feeling is contrasted with knowing (cognition) and desiring, willing, and striving (conation). To distinguish feelings from sensations, they are usually described in psychology by the term affects.

All animals possess a tendency to seek pleasure and avoid pain, to relieve tension, and to feel elated by success and depressed or angered by failure. The primitive effects are, therefore, held to be exhilaration, ease, distress, anger, and depression. As mental life develops a great variety of emotions appear. The chief function of affective states is to modify the response of the organism to stimuli from the outer world or the bodily organs; e.g. disgust affects appetite. The chances of survival both of individuals and groups are directly related to the degree to which affects are adjusted to external reality and encourage suitable behaviour. Inappropriate, exaggerated, or deficient affects are a marked feature in mental disease.

**Fee Simple** (Lat. *feodum simplex*). Highest estate known to English law. A tenant in fee simple is what is popularly styled a freeholder. Though in theory the sovereign is the lord paramount, the freeholder can grant his land away or devise it to whomsoever he likes by will. It is presumed that any grant of land is of the fee simple. See Land Laws.

**Fee Tail** (Lat. *feodum talliatum*, limited). Form of freehold estate set up originally by the Statute De Donis, 1285, by which a grant to X and the heirs of his body gave X an estate tail. This estate would last only as long as X had heirs of his body, and would then revert to the grantor. This led to Fines and Recoveries, tortuous legal fictions by which the estate became fee simple. In 1833 a new Act was passed by which, by a deed enrolled, X could convert his holding into a fee simple. In 1926 a fee tail became an equitable interest. See Enail.

**Fehling's Solution**. Alkaline solution of copper used for the detection of sugars. Solution No. 1

is prepared by dissolving 34.65 grams of pure copper sulphate in distilled water and diluting to 500 c.c. Solution No. 2 is made by dissolving 50 grams of sodium hydroxide containing not less than 97 p.c. of the salt, and 175 grams of recrystallised Rochelle salt in about 400 c.c. of water, and afterwards diluting to 500 c.c. When required for use equal volumes are mixed together.

**Fehmarn** OR FEMARN. Island in the Baltic Sea, part of Germany. In area 71 sq. m., it lies off the E. coast of Holstein, from which it is separated by the narrow Sound of Fehmarn and from the Danish island of Maribo on the N. by the Fehmarn Belt. The surface is level and the soil fairly fertile. Its few harbours accommodate vessels of shallow draught. Agriculture, fishing, and the rearing of cattle and sheep are the main occupations. The only manufacture of importance is hosiery. The capital is Burg. Prussia annexed the island in 1866 as a result of her victories over Denmark and Austria.

**Fehmarn Belt**. Channel between the Baltic islands of Fehmarn and Maribo. It has a width of about 12 m., and leads from the Baltic to Kiel Bay. Fehmarn Sound is a narrow passage between the island of Fehmarn and the mainland.

**Fehmgericht** (Ger. *Veme*, punishment; *Gericht*, judgement). A medieval German tribunal. Known sometimes as the Holy Vehme, it exercised power, especially in Westphalia, in the 14th and 15th centuries, and is believed to have been a survival from the jurisdictions of the Saxons. The courts were open for trial of civil matters, but might be secret in special cases. It has been estimated that, in the 14th century, the members (*Schöffen* or *Freischöffen*), bound by an all-embracing oath of fidelity, numbered about 100,000.

The government of the tribunal was vested in the king's deputy, the *Stuhlherr*, before whom all members were liable to account for their acts. It had affinity with the process of summary jurisdiction in Anglo-Saxon England, those found guilty of capital offences being hanged, a dagger bearing the secret letters S.S.G.G. being placed on the corpse. As civilization progressed its power waned, to some extent through abuse. The Fehmgericht existed as a sort of minor police court until suppressed by Jerome Bona-

parte in 1811. It was revived in a spurious form by the illegal Free Corps in 1919. Consult Introduction, Anne of Geierstein, W. Scott, 1831.

**Fehrbellin**. Town of Germany, in Brandenburg, 40 m. N.W. of Berlin. Pop. 1,600. It is famous for the great victory gained by the Prussians, then the Brandenburgers, under the Great Elector, over the Swedes, June 18, 1675. A monument marks the site of the battle, which the Prussians regard as a memorable one. It was the beginning of Prussia's military power, as till then the Swedes had been considered all but invincible.

**Feilding**. Town in the North Island of New Zealand. The distributing centre for a large tract of country, it is well laid out around a fine square, and is situated 99 m. N.E. from Wellington by rly. There are dairy factories in the neighbourhood, and the livestock sales are the largest in the North Island. There are also sash and door factories, freezing works, and flour mills. Feilding was a settlement opened in 1874 by an English company represented by Colonel Feilding, and presided over by the duke of Manchester. Pop. 4,700.

**Feilding**, ROBERT (c. 1651-1712). English rake, called Beau Feilding. A member of the Denbigh family, he led a regiment in Ireland for James II. After squandering the fortune of his first wife, a daughter of the 1st viscount Carlingford, he married a daughter of the 1st marquis of Clanricarde. After her death he married, in 1705, Mary Wadsworth, represented to him as a wealthy widow, and in the same year also married the duchess of Cleveland, Charles II's former mistress. In 1706 he was convicted of bigamy. Feilding was satirised by Steele and Swift. He died May 12, 1712.

**Feiling**, KEITH GRAHAME (b. 1884). A British historian. Born Sept. 7, 1884, he was educated at Marlborough and Balliol College, Oxford, received a fellowship at All Souls, and after experience as a lecturer and tutor, including two years at Toronto, 1907-09, was appointed Chichele professor of modern history at his own university in 1946. Feiling specialised in the politics of the 17th century, and also constituted himself the historian of the Conservative tradition in English history. He wrote *History of the Tory Party (1640-1714)*, 1924; *What is Conservatism?* 1931; *The Second*

Tory Party (1714-1832), 1938; and the official Life of Neville Chamberlain, 1946.

**Feira de Santa Anna.** Town of Brazil, in the state of Bahia. It is about 30 m. N. of Cachoeira, on the Bahia-S. Francisco rly. The centre of a region rich in minerals, it produces marble, gold, and diamonds. There is trade in cereals, tobacco, and cotton. Cattle fairs are held.

**Feis.** Irish word for an assembly. Something like the folk moots of the Anglo-Saxons, these were mainly meetings for the promulgation of laws by the kings, but they had also a festive element. They were frequently held in Ireland, some being national and others local. The most noted was the feis held regularly at Tara for several centuries until 560. Over it the supreme king presided. The word is still in use; for instance, in 1897 a *feis ceoil* was founded to encourage Irish music.

**Feisal I** (1883-1933). King of Iraq. The third surviving son of Hussein, king of the Hejaz, he was born at Rahab, Arabia, May 20, 1883, but left it when six years old. He spent 18 years in Constantinople (Istanbul), where he received appointments under the Turkish government. Along with his brothers, Ali and Abdullah, he took a leading part in the movement which led to the deposition of Abdul Hamid. He commanded the Arab contingent in the Turkish campaigns in the district S. of Mecca, against a new religious sect which was threatening the stability of the emirate of the Hejaz.

When, in June, 1916, his father sided with the Allies against Turkey in the First Great War, the ameer Feisal commanded the rebels in Medina, but was defeated by the Turks. He then presented to the British a scheme for the formation of an Arab regular army. In conjunction with T. E. Lawrence he advanced in 1917 to Akaba on the border of Syria, and Feisal's army eventually formed Allenby's right wing in Palestine. On Oct. 3, 1918, he led his troops into Damascus. His services in the conquest of Palestine and Syria were rewarded with the privilege of setting up in Amman, Damascus, and Aleppo a

provisional military administration which was guaranteed to the Arabs as an independent sphere by the Sykes-Picot treaty.

Acclaimed king, and for a while *de facto* ruler, of Syria, Feisal represented his father, now ruling over Hejaz, at the peace conference, but was unable to prevent the French demand for a mandate over and occupation of Syria. Again proclaimed king by the extremists, he was expelled by the French in 1920. Next year he undertook the kingship of Iraq, under the aegis of Great Britain, inaugurating his reign on Aug. 23 after a plebiscite. Feisal settled the country on a firm basis, established good relations with Persia and Turkey, checked the unruly Nationalist element and the Wahabis on the frontier, and secured the acceptance by all parties in 1927 of the Anglo-Iraq treaty, by which his adopted country was to join the League of Nations. Iraq became independent in 1932, but the last year of Feisal's reign was marred by the Assyrian rebellion while he was on a state visit to London. He died Sept. 8, 1933, and was succeeded by his son Ghazi. Though sometimes accused of tortuous diplomacy, Feisal steered his kingdom safely through difficult times. A Life by Mrs. S. Erskine appeared in 1933. See Arabia; Lawrence, T. E.; Palestine, Conquest of.

**Feisal II** (b. 1935). King of Iraq. Born May 2, 1935, he succeeded to the throne on April 4, 1939, on the death of his father, King Ghazi, in a motor accident. Until the king should come of age, Iraq was placed under the regency of his uncle, the ameer Abdul Illah. During the German-inspired Iraqi revolt in April, 1941, the young king was compelled to leave Bagdad, but when the British authorities restored order in June, he and the regent entered the capital in state. At school in England from 1947, he entered Harrow 1949. See Bagdad; Iraq.

**Felanitz** or **FELANICHE**. Town of Spain, in the island of Majorca. It stands in a mt. valley, 23 m. S.E. of Palma, and 7 m. from its port, Puerto Colon. On the mt. of Puig de San Salvador, in the

vicinity, is a Moorish castle with underground vaults. The church of San Miguel is a fine building. Brandy is distilled and soap manufactured. There is trade in cattle, wine, fruit, and earthenware, the water coolers of Felanitz having been noted from the 3rd century B.C. Pop. 11,353.

**Feldspar.** One of the most important groups of rock-forming minerals, consisting essentially of



**Feldspar.** Huge masses of orthoclase, weighing many tons, at Carne, near Vervan, Cornwall

alumino-silicates of the alkalis. They may be grouped into two main groups, the plagioclase feldspars and the potash feldspars. The plagioclase feldspars form a continuous series, the two end-members being albite (soda-feldspar) and anorthite (lime-feldspar); all mixtures of the two occur and the intermediate minerals are called oligoclase, andesine, labradorite, and bytownite. The soda-rich end of the series is characteristic of acid rocks and lime-bearing varieties of basic rocks. The plagioclase feldspars crystallise in the triclinic system.

The potash feldspars include sanidine, orthoclase, microcline, and adularia. All have the same composition and are monoclinic, with the exception of microcline, which is triclinic. Intergrowths between orthoclase or microcline and soda-rich plagioclase feldspars are known as perthites.

Potash and soda feldspar is used in ceramics for pottery, glazes, etc.; in glass manufacture; abrasives; roofing materials; and false teeth; some stones (Amazon stone, sunstone, and moonstone) are prized as gems. All the commercial deposits occur in pegmatite dykes, mainly associated with granitic rocks. For details of the various types, see Microcline; Moonstone; Orthoclase, etc. See also Crystallography illus.

**Felidae** (Lat. *felis*, cat). Family of the carnivora, or flesh-eating mammals, which includes the cat-like animals. They comprise only



**Feisal I,  
King of Iraq  
Russell**

two genera, but a large number of species, and are regarded as the typical carnivores, being the best adapted for catching and preying upon living animals, and, with the exception of the weasels, the most lithe and active of the order.

They are provided with finely developed canine and carnassial teeth and their sharp claws are retractile. One marked feature of the family is the short and rounded muzzle, which is in conspicuous contrast with the long and sharp muzzle in the dogs. Their fur is soft and often handsomely marked, and their feet are provided with cushion-like pads which enable them to move about silently. All are of savage disposition, and only two species have been domesticated with any success. See Cat.

**Felix** (d. c. 647). English saint and bishop. A native of Burgundy, he came to England, and, helped by Sigebert, king of E. Anglia, preached Christianity. Felix became bishop of Dunwich, and is said to have founded the monastery at Soham. His name survives in Felixstowe, Suffolk. His festival is kept on March 8.

**Felix**. Name of four popes and five anti-popes, of whom the following are notable. Felix I (d. 274) is entered in the Roman martyrology probably in mistake for a Roman martyr of the same name buried on the Via Aurelia. A letter of the pope's in response to a report by the synod of Antioch, which had deposed its heretical bishop, Paul of Samosata, was made use of at the council of Ephesus (431). To Felix I, who reigned 269-74, was attributed a decree for the celebration of masses over the tombs of the martyrs. His festival is kept May 30.

Felix II, pope 355-58, was a Roman archdeacon intruded into the papal chair on the banishment of Liberius by the emperor Constantius. On the return of Liberius, Felix was exiled and lived in retirement until his death, Nov. 22, 365. Felix III, pope 483-92, was chiefly engaged in conflicts with heretical bishops at Alexandria and Antioch. Felix IV, pope 526-30, was the nominee of Theodoric the Goth. He obtained an edict from Theodoric's successor ordering all charges against the clergy to be taken to ecclesiastical courts.

Felix V, anti-pope, was born at Chambéry, Dec. 4, 1383. He reigned as duke Amadeus VIII of Savoy 1416-34, when he retired



Felixstowe. The foreshore of this holiday resort popular Suffolk

in favour of his son. In 1439 the remnant of the council of Basel elected him as pope, although he was not in orders, in place of pope Eugenius IV, whom they declared deposed. As Felix V he was crowned in July, 1440. He never obtained general recognition, but with some following in Switzerland and Savoy he held his position till 1449, when he abdicated. He died at Geneva, Jan. 7, 1451, last of the anti-popes.

**Felix Antonius**. Brother of the freedman Pallas, minister of the Roman emperor Claudius. He was procurator of Judaea, but was recalled in A.D. 62 to answer charges of oppression made against him by the Jews. It was before Felix that S. Paul preached at Jerusalem (Acts 23, 24).

**Felix Holt the Radical**. A novel by George Eliot, first published in 1866. It presents in broad effect the life of a midland county during the 1832 Reform period, but there is something unreal about the central figure, who is too philosophical and cold-blooded to represent the enthusiastic reformer of that time.

**Felixstowe**. Health and pleasure resort and residential town of Suffolk, England. Situated in the S.E. corner of the county, it stands on a cliff facing S. between the rivers Deben and Orwell, 11 m. by railway S.E. of Ipswich, and 81 m. from London by road. Its beautiful cliff gardens and sea front, two modern band pavilions, bathing facilities, first-class tennis courts, and opportunities for other sports are among its attractions. Felixstowe is a good centre for the tourist exploring the Constable country and the Suffolk churches. Here is



Felixstowe arms

the marine aircraft experimental establishment. The town derives its name from that of the 7th century bishop S. Felix. Pop. approx. 14,000.

**Fell** (Scand. *fjeld*, mountain or rock). Term occurring in the names of many British mountains, e.g. Cross Fell, Goat Fell, Snaefell.

**Fell, JOHN** (1625-86). English pedagogue and divine. Born June 23, 1625, he was educated at Christ Church, Oxford, of which he became dean in 1660. Vice-chancellor of the university 1666-69, he was appointed bishop of Oxford in 1675. He notably improved the buildings as well as the discipline of his college, but is chiefly remembered by some lines, "I do not love thee, Dr. Fell," etc., attributed to Thomas Brown (q.v.). He died July 10, 1686.

**Fellah** (plur. Fellahin). Arabic word for peasant or ploughman, especially in Egypt. Forming the



Fellah. Egyptian sakra or water-carrier

bulk of the native population, the fellahin descend in direct lineage from the ancient Egyptians. They dwell in villages, mainly of mud hovels, under a village chief, the sheikh-el-beled. A wooden statuette, now at Cairo, of a IV dynasty official, found by Mariette at Sakkara, was given that title by the workmen from its likeness to their own headman. Some fellahin are Christian Copts; millions of others adhere to Mahomedanism.



Of medium height, black-eyed, thick-lipped, and straight-nosed, the Semitic and Nubian elements they have absorbed have but slightly affected their racial make-up as a Caucasian people of the Mediterranean type. The progressive deepening of hue from N. to S. marks the influence both of climate and of ethnic contact. The women, who wear head-veils, which expose the antimony-stained eyelashes and tattooed chin, are sometimes wed by the nomad Beduins, but the amount of racial mixture in actual progress is inconsiderable.

Their food is largely vegetable, and they are mostly abstemious. Many of their methods of cereal and pulse cultivation, and of irrigation with water-wheel, sakiya, and balanced bucket, shaduf, are of remote antiquity. The water-carrier, sakka, is often a member of a dervish sect, whose ritual demonstration, zikr, is the occasion of much festivity, wherein quarter-staff, nabut, is a favourite game. The veneration of trees and stones, and the universal employment of amulets, mark the persistence of the predynastic animism of the Nile valley. Those peasants of Palestine also called fellahin are descended from the primitive Canaanite stock. Except for a few colonies introduced under Mehemet Ali they have no ethnic identity with the fellahin of Egypt.

**Fellmonger.** Dealer in the pelts of slaughtered sheep, one who separates the wool from the hides. The skins may be soaked in lime-water until the roots of the fibre are loosened sufficiently to come away with ease, a method which gives the so-called slipped wool. Alternately the skins may be hung in moist air until bacterial action has loosened the fleece, and this is the method adopted in Mazamet, France, the chief centre of fellmongering. Chemical means may be substituted, the flesh side of the hide being painted overnight with a solution of sodium sulphide. *See* Leather.

**Fellow.** Word meaning a male person. It is now used in two senses. In general speech, rarely in a slighting sense, it means a man, and academically it refers to certain members of colleges at Oxford, Cambridge, or elsewhere, and to members of learned societies. The original meaning was that of a companion, hence the phrase fellow-countryman, and this survives in its use at the universities, where it is the equivalent of the Latin *socius*.

In the colleges of Oxford and Cambridge a fellow is a member of the governing body and foundation, and a fellowship is a coveted distinction bestowed on scholars of exceptional ability. Before the reforms of 1877-81 fellows were usually chosen for life, or until marriage. Today they are chosen by the existing fellows, usually for a definite term of years. They may be elected on a reputation or after examination, or because suitable for a particular vacancy on the teaching or managing staff. Many of them act as tutors, and form the group that with the head is responsible for the work of the college.

The fellows of Eton and Winchester form the governing body. The fellows of Trinity College, Dublin, who are divided into senior and junior fellows, are elected after examination, and hold the position for life. King's College, London, and some other colleges, have fellows, but their duties are rather different from those at the older universities. Following this use, fellow is used for a member of a learned society. *See* University.

**Felo de se** (late Lat. *felo*, evil doer, *i.e.* slayer; *de se*, of himself). English legal term, meaning a man who commits a "felony against himself"—in other words, a suicide. A suicide used to be buried, as Thomas Hood puts it, "at four cross roads, with a stake in his inside." This ended in 1823, and the body of a suicide was ordered to be buried in the usual burial-ground without divine service, between 9 p.m. and midnight. In 1882 the night burial was abolished and a religious service permitted; but the burial service of the Church is not allowed by the rubrics to be used. *See* Suicide.

**Felony.** Class of crime in English law. By common law all crimes are either felonies or misdemeanours. Nobody knows for certain the original distinction between them; one theory is that a felony was originally a crime involving a breach of the king's peace. Certainly until 1870 the lands and goods of a felon were forfeited to the crown.

It is a crime to conceal a felony—misprision of felony—but not to conceal a misdemeanour. When a felony has been committed a private person may arrest without a warrant anyone he reasonably suspects of having committed it. A constable may arrest without a warrant a person he reasonably suspects of having committed a felony even if it transpires that none has been committed. With

some few exceptions no such powers of arrest exist in the case of a misdemeanour (*q.v.*).

**Felsite.** Close-grained or compact rock of varying colour. It consists of altered lava which has lost its glassy structure. Small crystals of feldspar and quartz are scattered through the ground-mass of the rock. *See* Rhyolite.

**Felspar.** Variant spelling of name of a group of rock-forming minerals, described in this Encyclopedia as feldspar.

**Felsted School.** English public school. It was founded in 1564 by Richard, Lord Riche, and is now governed by a scheme dating from 1876. It consists of six senior houses of fifty boys each, and a junior house of eighty boys. The grounds are 55 acres in extent. There are at least nine entrance scholarships each year. The village of Felsted, sometimes spelt Felstead, is 3 m. S.E. of Dunmow, Essex, on the railway. Pop. 1,845.

**Felt.** Kind of cloth which properly consists of fibre aggregates, compacted by heat, rubbing, and moisture, and is not woven. (Needlefelts consist of fibres consolidated on to a central coarse hessian cloth.) The pressed felt industry uses wool as its raw material, with rabbit and other animal hairs in some hat felts. The fibres are scoured and well blended, then passed through a carding process to produce a web. These webs are superimposed to form "batts" 40 yds. long, between  $\frac{1}{2}$  in. and 1 in. thick, and 36-80 ins. wide. These are again superimposed to give a thickness of between 6 ins. and 3 ft.

The hardening process follows, the fibre mass being compressed between two metal platens, with a pressure of 5 to 10 lb. per sq. in. Steam is blown in through perforations in the lower platten, and the upper platten has an oscillating movement. By this means a batt 3 ft. thick becomes reduced to 4 ins. The partly-felted batt is then filled, *i.e.* soaked in soap solution (for felt hats) or dilute sulphuric acid (for mechanical pressed felts) and subjected to blows from heavy wooden hammers. Five minutes' treatment suffices for light felts, but 12 hrs. or more is required for thick mechanical felts. Shrinkage of 25-75 p.c. occurs in all directions during fulling. The resulting felt is scoured, dried, pressed, and loose hairs are sheared off. The complete process takes 7-10 days.

Needlefelts are used for carpet underlays and packaging of a variety of materials. Roofing felts are

impregnated with bitumen and other substances to make them impervious to water. Knitted felts, i.e. knitted wool fabric subjected to a fuling process till it resembles felt externally, have been used for hats, etc. Clement of Rome was commemorated by hatters as the inventor of felt. See Hat.

**Feltham.** An urban district of Middlesex, England, comprising the parishes of Feltham, Hanworth, and Bedfont. It is 12 m. W.S.W. of London, with a rly. station. Large industries in the area include aircraft, plastics, and the making of sparking plugs and fire extinguishers. Hanworth air park and part of London (Heathrow) airport are in the district. Pop. est. 42,000.

**Feltmakers' Company.** London city livery company. Originally an offshoot of the Mercers,



Feltmakers' Company arms

and later (in 1501) of the Haberdashers, it was granted a separate charter by James I in 1604. An Act of Parliament had been passed in 1566 instituting a seven-year apprenticeship for all journeymen feltmakers, of whom there were 7,000 in London at the time of the charter. The authorised livery is now 350. The offices are at Arundel House, Arundel Street, W.C.2.

**Felton, JOHN** (c. 1595-1628). English assassin. He came of a good Suffolk family, early entered the army, and served as lieutenant at Cadiz in 1625. Failing to obtain a captain's commission, he applied personally to the duke of Buckingham, who refused his request. Poverty and his animosity against Buckingham, increased by brooding over the attacks on the king's favourite, turned his thoughts to assassination, and he mortally stabbed the duke at Portsmouth, Aug. 23, 1628. He was hanged at Tyburn, Nov. 28 of the same year.

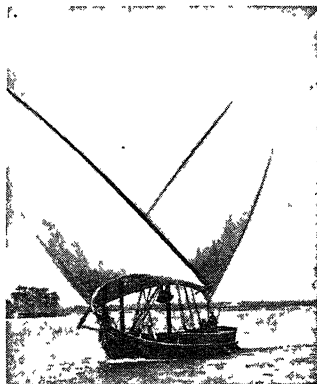


John Felton, English assassin  
From an old engraving

**Feltre** (anc. *Feltria*). City of Italy, in the prov. of Belluno. A picturesque place, standing on an eminence near the Piave river, 885 ft. above sea level, it is 34 m. by rly. N.W. of Treviso. It has a ruined castle, a cathedral, a mod-

ern palace, and a municipal pawnshop, said to be the oldest establishment of the kind in Europe. Minor buildings include a hospital, gymnasium, seminary, and an asylum for orphans. In 1819 the bishopric was incorporated with that of Belluno. There is trade in wine, oil, and silk. Pop. 19,000.

**Felucca** (Arab. *fuluka*; Ital. *feluca*). Vessel used in the Levant



Felucca. Egyptian sailing boat on the Nile above Cairo

and on the Nile. It is propelled by lateen sails and oars, and moves swiftly. Sometimes the helm can be used at either end of the hull.

**Felup** or **FULUP**. Collective name applied by Portuguese traders to numerous primitive negro tribes in the coast-lands of French Senegal and Portuguese Guinea. Under the Mandingan name Jola they extend into British Gambia. Their allied semi-Bantu dialects prevail from the Gambia and Casamance to the Cacheo and Geba rivers. The typical Felup are muscular, flat-nosed, thick-lipped, dark-bronze-coloured hunters, almost unclad, using bow and arrow and inhabiting roughly constructed log-huts or earth-houses.

**Feme** or **FEMME**. Anglo-Norman legal term for a woman. A woman who is married is called *feme covert*, and a woman who is either a spinster, a widow, or divorced, is *feme sole*.

**Femina Vie Heureuse.** The name of this literary award has been changed to Stock Prize (*q.v.*).

**Feminism** (Lat. *femina*, a woman). Term originally used to signify the qualities of females, employed in 1895 and later to mean the advocacy of the claims and rights of women. Feminism in the second and more usual sense is a century older than the use of the word to describe it, finding its first clear expression in Mary Wollstonecraft's *A Vindication of*

the Rights of Woman (1792). "She set great value on a mutual affection between persons of an opposite sex," wrote her husband, William Godwin, in his memoir of her; "she regarded it as the principal solace of human life." But she also thought that nothing should keep a man and wife together once mutual love and respect had gone. She advocated that women should be educated in an "orderly manner" to fit them to engage in business—"women would not then marry for a support"; that they should become doctors and nurses, and in particular midwives; that they should have "a civil existence in the state, married or single"; that they should not be "arbitrarily governed without having any direct share in the deliberations of government."

In the world into which she projected these ideas, the education of men was indifferent, and of women non-existent; no women and few men had any political rights; married women had no legal existence as individuals, could possess nothing, had no rights in the custody of their children. Both women and men for the most part greeted Mary Wollstonecraft's ideas with ridicule; but some fifty years after her death they began to produce effects, thanks to the help and encouragement given to women by men like F. D. Maurice, John Stuart Mill, Canon Butler, Arthur Hugh Clough, Sidney Herbert, and Newson Garrett.

#### Talfourd's Act

Thomas Noon Talfourd, Whig member of parliament for Reading, and a serjeant-at-law, was responsible for the first step taken in the legal recognition of women's rights as human-beings. Led through disgust at his own success in depriving mothers of access to their children in the course of his legal practice, he secured the passage of an act in 1839 which gave a separated wife custody of her children till the age of seven, and access to them afterwards, provided she could prove she was guiltless of adultery. Maurice promoted the foundation of Queen's College, a school opened in 1848 for the training of governesses—the first school for women that had any claim to a standard of learning.

The first society for female suffrage was formed at Sheffield in 1857, and J. S. Mill brought the subject to general notice by putting female suffrage prominently in his election address in

1866 when he stood (and was returned) for Westminster. The National Society for Women's Suffrage was founded two years later, and in the same year Mill presented the first petition for women's suffrage to Parliament; thereafter petitions were persistently presented and bills brought in, by Mill and others.

Until 1857, divorce was possible only by private act of parliament in each individual case, and only the husband could initiate a divorce bill. In that year an act, promoted by the Attorney-General Sir Richard Bethell (afterwards Lord Westbury), gave both spouses the right to divorce, to the husband for adultery by his wife, to the wife for adultery plus cruelty or desertion by her husband; the same act also gave the wife for the first time legal control of any earnings or inheritance she might acquire after separation. Not until 1870 was the first Married Women's Property Act (*q.v.*) passed: this bill was introduced into the house of commons by Russell Gurney, Q.C., who, with his wife, was also a consistent worker for the advancement of women's education. From these beginnings, increasing rights and responsibilities were demanded in Great Britain for women by both women and men feminists, and steadily devolved upon them. (*See Women's Suffrage.*)

#### Slow Progress on the Continent

Feminism, spreading steadily round the world wherever Protestantism and the Anglo-Saxon way of life held sway, was slow in starting on the continent of Europe. The teaching of Roman Catholicism on marriage hindered its birth in R.C. countries; the Code Napoléon, by giving the wife an inescapable claim on her husband's estate, removed in the countries where it (or its derivative systems) ran one of the bases of feminism in Great Britain.

In tsarist Russia, men and women revolutionaries worked on an equality, and when the revolution came in 1917 equality of status and opportunity was extended to women. Under the Weimar constitution women were given equal political status with men in Germany. In the United Nations Charter the United Nations reaffirmed their "faith in the equal rights of men and women"; and at the end of the Second Great War, women were admitted to the franchise in a number of countries where there had been little or no feminist movement before it (*e.g.*

France, Italy, Hungary). But a movement in the reverse direction had set in: National Socialism deprived German women of the rights they acquired under the Weimar constitution; in Soviet Russia, differentiation in education and opportunity between the sexes was reintroduced in 1943.

Irene Clephane

**Femmes Savantes**, *LES* (The Learned Women). Five-act comedy by Molière, first acted at the Palais-Royal, Paris, March 11, 1672. In it Molière returns to the theme of feminine affectation less seriously treated in his *Les Précieuses Ridicules*. The easy-going bourgeois Chrysale is at the mercy of a wife and one of his two daughters. The wife has more pretence to learning than knowledge or intelligence, and the elder daughter, Armande, is like her. Clitandre, suitor to Armande, is rebuffed, and turns to her more simple-minded sister Henriette, whom the mother wishes to marry the parlour-poet Trissotin. The *dénouement*, in which Henriette and Clitandre are united, is brought about by Chrysale's brother Aristote, who exposes the mercenary character of Trissotin. Molière acted the part of Chrysale. Trissotin is accepted as a caricature of the Abbé Cotin.

**Femoral Artery** (Lat. *femur*, thigh). Main artery of the thigh running from the groin to a point rather above the knee, where it becomes the popliteal artery and is continued down the leg. It gives off numerous branches, which supply the muscles and skin with blood.

**Femur** or **THIGH-BONE**. Longest bone in the human body. Above it articulates with the pelvis to form the hip-joint, and below with the patella (knee-cap) and tibia to form the knee-joint. The superior extremity consists of a rounded eminence, the head, which fits into the *acetabulum* or socket of the pelvis, the neck, which is set at about an angle of 125° with the shaft of the bone, and two bony prominences known as the greater and lesser *trochanters*, which serve for the attachments of muscles. The shaft of the femur is somewhat convex forwards, and in the central third of the posterior surface bears a prominent ridge, the *linea aspera*, to which muscles are attached. The inferior extremity broadens out into two expansions, the internal and external tuberosities, which end in two smooth rounded articular eminences known as the condyles, separated from each other by a deep depression, the inter-condylar notch.

Fracture of the shaft of the femur is a common accident. If due to indirect violence the fracture is usually oblique; if due to direct violence, more or less transverse. Unless complicated by serious damage to the soft parts, the fracture usually unites in 6 to 8 weeks, though the leg should not be made to bear the full weight of the body for another two months. The two Great Wars saw great advances in treatment of these fractures by mechanical aids. Fracture of the neck of the femur is most often met with in elderly persons, whose bones have become weakened by atrophy. The condition is always serious in aged persons, owing to the difficulty of getting the broken fragments to unite, and to the risk of pneumonia supervening, which is always present when it is necessary to keep an elderly patient in bed for a long time. *See Hip-joint; Knee-joint.*

**Fen**. Anglo-Saxon word for marshy or boggy land. The district of this nature in Cambridgeshire, Norfolk, Huntingdonshire, and Lincolnshire is known as the Fens. The will o' the wisp is sometimes called the fenfire, while fenberry is another name for the cranberry.

**Fence**. Device used on farms for boundary purposes, to prevent stock from wandering and as a wind-screen. The proper establishment and maintenance of fences is costly; they often waste valuable ground, and neglected hedges in particular harbour vermin and weeds, the latter often serving to maintain insect and fungoid pests.

Turf fences, chiefly consisting of mud and stones, are cheap and fairly durable if properly drained and protected from the rain by coping-stones. Walls, usually of the dry sort, without cement or mortar, are much favoured where suitable flat stones are available. They last for many years if carefully built, but after 50 years or more they are liable to get out of plumb, and fall after winter frosts.

Wood and wire fences include a large number of contrivances. These may consist entirely of wood (palings, stakes, brushwood, post and rail), wood and wire, or wire with iron or concrete standards. Wood lasts much longer if treated with creosote or stop-rot composition, or simply tarred. That part of a post driven into the ground should previously be tarred.

As a general rule the owner of land is not bound to erect or maintain a fence at its boundary, but if this is the only method of

preventing his cattle from going on to a neighbour's land, it will be necessary to fence. There is usually no duty to fence land running alongside a highway; even if animals escape on to the highway and cause damage the owner of the land is in general not liable.

There is, however, a liability to fence excavations near a highway and in certain districts to fence land adjoining a street to prevent it becoming a source of danger to passengers or from being used for purposes causing annoyance to the public. Railway companies must make and maintain fences along the side of their railway. Barbed wire must not be used in fences along a highway in such a manner as to be likely to injure persons or animals. By the Barbed Wire Act, 1893, a local authority may compel the occupier of land on which there is a barbed wire fence adjoining a highway to abate the nuisance. One useful kind of wire fencing is rabbit-proof netting.

#### Hedges and Ditches

Hedges are particularly characteristic of many parts of England. They are costly, however, and require continual care. Hedging is an expert rural art, and involves not merely lopping of superfluous twigs and branches, but also "laying" at least every 20 years. In this process the main stems are partly cut through not far from the bottom, bent into an oblique or horizontal position, and then secured. This promotes the growth of shoots at the base of the hedge, without which it will never form a thick continuous stock-proof barrier. Equally important is the provision of a ditch adequately drained, and its maintenance in a clean condition free from weeds and rubbish. The best hedge-plant is the hawthorn (quick), while beech and hornbeam are also good.

**Fenchurch Street.** London thoroughfare. The name is believed to have been derived from the fenny ground in the vicinity when the Langbourne was a running brook. The street runs E. from Gracechurch Street, describing a northward curve until it meets Leadenhall Street at Aldgate Pump. At the London Tavern, rebuilt in 1877, Queen Elizabeth is supposed to have dined in 1554. Shipping companies have their headquarters in the street. Mark Lane and Mincing Lane, on the S. side, are well known in the history of commerce. Fenchurch St. station is the terminus of the line to Tilbury. The street suffered damage in the Second Great War.

**Fencible.** Term applied to regiments of infantry and cavalry raised in Great Britain in the late 18th and early 19th centuries for local defence in time of emergency. Numbers of fencible units were

embodied in 1804 at the time of Napoleon's threatened invasion of England. Later, certain fencible regiments, revived as yeomanry units, were eventually embodied in the Territorial Army (*q.v.*).

## FENCING: ITS HISTORY AND PRACTICE

C. L. de Beaumont, Hon. Sec., Amateur Fencing Association

*The graceful art of swordsmanship, sprung from methods of fighting of great antiquity, achieved a wider popularity as a sport in the course of the 19th century. It is here described in some detail*

The art of swordsmanship is of the greatest antiquity. Fighting with a variety of weapons under set rules was practised among the Persians, Greeks, and Romans. Up to the 15th century, however, swords were heavy and clumsy; it was not until the general disuse of armour led to the transformation of weapons to forms better adapted for speed and neatness that fencing began to develop into an art.

During the 15th century schools and masters of fence grew rapidly in numbers and skill. Germany became the cradle of systematic swordsmanship, and the masters formed guilds such as the famous Marx brüder of Frankfort. Similar associations of professional swordsmen grew up in Spain, N. Italy, and, later, in France. The swordsmanship in these schools was of the rougher kind and many wrestling tricks were used.

The Italians were the first to recognize the superior efficiency of the point and, towards the end of the 16th century, they developed lighter weapons and nimbler and better controlled methods which spread all over Europe and developed into rapier fencing. Fencing masters discontinued the teaching of wrestling tricks, the lunge was discovered, and rapier fencing became an art.

#### The Science of Fencing

The rapier, although well balanced, was too long and heavy for a swordsman to make quick parries with the blade. Body movements, ducking or vaulting aside (*incartata*), were used to avoid thrusts, or the left hand protected with a gauntlet or armed with a dagger was used to parry. Right-hand attacks and left-hand parries were characteristic of rapier fencing.

A scientific system of fencing, based on mathematical lines and diagrams drawn on the floor within a circle, was established in Spain at the beginning of the 17th century.

During the reign of Louis XIV the adoption of the short court sword led to the development of

the French school of small sword fencing which rapidly displaced rapier fencing, the dagger was no longer used, and hits were made with the point only, parries being made with the blade.

Owing to the danger of injury when fencing, various conventions were established and valid hits were restricted to those arriving on the breast; many of these conventions have survived as the basis of the rules of foil fencing.

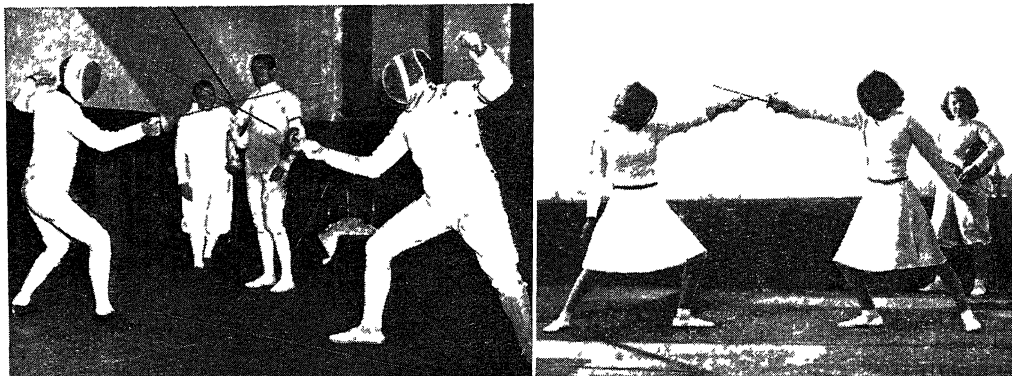
The invention of the mask by La Boëssière about 1780 permitted the evolution of complicated phrases including remise, counter riposte, and redoublement, and the development of foil fencing as we know it today.

Towards the end of the 19th century épée fencing, approximating to the conditions of a duel, was developed, while the light Italian sabre replaced the heavy military sabre which had continued the tradition of back-swording.

#### Teaching the Art in England

Swordsmanship was taught in England from early times. In 1285 Edward I prohibited fencing schools in London. Swordsmen continued to be regarded with disfavour until Henry VIII granted a royal charter in 1540 to the "corporation of the maisters of the science of defence and other provosts of the same science." The corporation was granted the lucrative monopoly of teaching the art of fencing in England. Sword and buckler and the long (two handed) sword became the traditional English weapons and the rapier was not firmly established here until the latter half of Elizabeth's reign. Public displays of skill with swords were popular amusements in England from the 16th century onwards. Prize fights were displays of swordsmanship until mid-Georgian days when James Figg popularised prize fights with fists. Thereafter backswording became a provincial amusement, and eventually degenerated into singlestick.

Fencing was neglected in England during the Victorian era, and



Fencing. Left ; Competitors in the "on guard" position in an International Championship bout at the London Fencing Club. Right ; Contestants at practice for the Girls' School Fencing Championship demonstrate that swordsmanship is as graceful an art for women as for men

it was not until the end of the 19th century that the art of fencing was revived, mainly through the enthusiasm of Captain Alfred Hutton. The first amateur championships with foil and sabre were held in 1898, and in 1901 the Amateur Fencing Association was founded. From 1919 to 1939 fencing increased markedly in popularity throughout Great Britain, both for men and women, a large number of championships and competitions were held annually, and British fencers were represented in all the important international meetings including the Olympic games.

Fencing today is practised with three weapons, the foil, the épée, and the sabre. Foil fencing is the basis for the practice of sword play with all three weapons. At foil and épée hits must be made only with the point, at sabre hits are made with the point or with the edge (cuts) or with the first third of the back edge.

#### The Foil and the Sabre

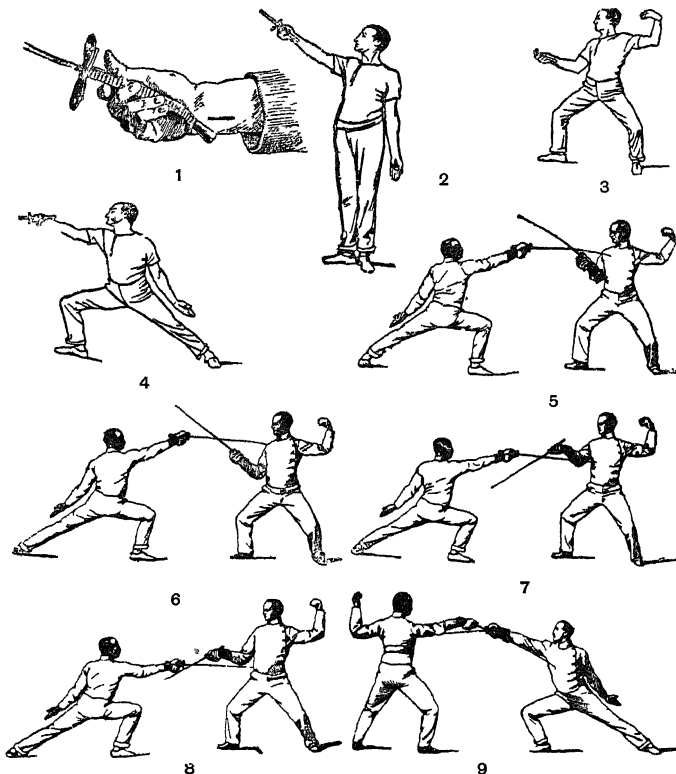
Fencing with the foil and the sabre is subject to the following conventions: (a) the target is limited: at foil, the trunk only, back or front; at sabre any part of the head, arms, or trunk approximately down to the waist; (b) all hits made direct on a part of the body other than the target stop the phrase and annul all subsequent hits; (c) all correctly executed attacks must be parried or completely avoided, and the phrase must be followed through.

Fencing with the épée reproduces, as far as possible, the conditions of a duel: the target includes every part of the fencer, and there are no conventions.

Each weapon consists of a blade and a mounting, which includes

the guard and the handle through which passes the tang of the blade at the end of which the pommel or locking nut is attached. A small cushion is generally fixed inside the guard as a protection for the fingers. The stronger part of the blade, *i.e.* the part nearest to the guard, is called the forte, while the remainder of the blade is known as the faible.

There are two main varieties of foils and épées — French and Italian. The French weapon has a plain handle and is manipulated by delicate finger work. The Italian weapon has a cross bar and two rings attached to the inner surface of the guard through which the first two fingers are placed, the pommel being strapped to the wrist. Fingerwork is largely



Fencing. 1. Position of hand on foil. 2. Preliminary position. 3. On guard. 4. Lunge. 5. Parry of quarte. 6. Parry of sixte. 7. Parry of septime. 8. Parry of octave. 9. Riposte from parry of quarte

sacrificed to added strength in manipulating the weapon.

Foils usually have bell guards or a double loop guard. Épées have bell guards which may be decentralised to give added protection to the outside of the sword arm. The guard of the sabre is curved to protect the hand from cuts. The flattened point or button of the foil must be covered with waxed thread. A triple steel point (pointe d'arrêt) is fixed to the button of the épée so that hits made on the opponent's clothing shall not glance off. An electrical judging apparatus is used in the major épée events. A martingale (a loop of cord attached to the handle and passed round the fingers) is obligatory to obviate accidents to onlookers if a fencer is disarmed.

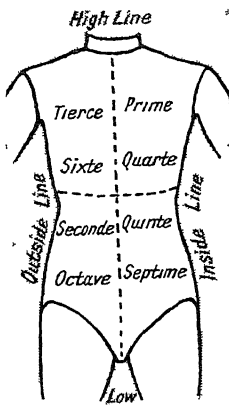
Clothing is usually made of light canvas (sail cloth) and must be white. The head is protected by a mask with canvas bib, and a glove or gauntlet is worn on the sword hand. A leather elbow guard should be worn at sabre. Canvas shoes should have leather soles in fencing on a linoleum floor, but rubber soled shoes are preferable on a wooden floor or out of doors. Foil and sabre competitions usually take place indoors on linoleum or cork strips; épée events in the open air on gravel or levelled soil. That portion of the field of play which is used for fencing is called the piste or fencing strip.

In fencing, an attack is made by straightening the arm with the point of the sword threatening the opponent, and lunging. The fencer defends his target by using his weapon to deflect his opponent's blade: this action is called a parry. When an attack is parried the fencer who has parried in his turn straightens his sword arm in order to hit his opponent: this action is called a riposte.

A direct thrust at the target will generally be parried. The real attack is usually preceded by one or more false attacks or feints designed to make the opponent parry too soon so that the attacker may deliver his real attack on some part of the target which his opponent leaves uncovered.

The target (trunk) is divided

by imaginary lines at right angles to each other. One line crosses the centre of the body from left to right; that part of the body above the line is called the high line, that part below is called the low line. The other line passes downwards from the centre of the



Fencing. Target for a right-handed fencer. A left-handed fencer must visualise the diagram in reverse

neck; that part of the body on the sword arm side of this line is called the outside line, that on the other side is called the inside line. (See diagram.)

There are eight parries at foil and épée—two to protect each quarter of the target. The position of the hand in relation to the target when forming some parries are indicated approximately in the drawings in p. 3294. Four of these parries are made with the hand in supination (palm upwards): sixte, quarte, octave, and septime; and four with the hand in pronation (palm downwards): prime, tierce, seconde, and quinte. Parries may be simple, or the opponent's blade may be deflected by a circular movement in the same line called a counter parry.

#### Variety of Attacks

Attacks may be simple, e.g. a direct thrust or a thrust made along the opponent's blade (coulé), a disengagement by passing the blade under the opponent's blade, or a cut-over (coupé) passing over the opponent's blade, or may be made after pressing, beating, or binding the opponent's blade, or may be composed attacks, i.e. preceded by one or more feints or by circular movements called the doublé describing a circle round the opponent's blade when he attempts to counter parry.

There are thus a variety of composed attacks using the movements of simple attacks, attacks on the blade, and the doublé either as feints or for the final movement. Similarly, after an attack has been parried, the riposte may be direct or by disengagement, or may be preceded by one or more feints, etc. The counter-riposte is a riposte made by the original attacker after parrying his opponent's riposte. The remise is the immediate continuation of the attack in the same line after the opponent has parried. When an attack or a riposte is delayed or is

preceded by a number of feints, a stop thrust or time thrust (coup d'arrêt) may be made. Attacks of second intention are then made after drawing the opponent's stop hit or attack and parrying the same, afterwards launching a counter attack.

At épée, the large target and the absence of conventions make it unwise to employ any wide movements such as the cut-over or attacks preceded by a number of feints because such movements expose the attacker to stop hits on the arm. Attacks and ripostes as well as stop and time thrusts tend to be concentrated on the nearest portion of the target, i.e. the opponent's wrist or sword arm. Since double hits count against each fencer, the cardinal rule at épée is to hit your opponent without yourself being hit.

#### Speed and Precision

The épée fencer must develop a sense of timing, judgement of distance, suppleness, speed of footwork, and speed, accuracy, and precision in placing his hits. The flèche attack is a running movement designed to hit the opponent by speed and surprise. It must be exceedingly well timed and requires sound judgement and great precision. Sabre play differs from foil and épée in that the edge is used as well as the point; in choice of time and distance it approximates more to épée than to foil. Simple movements and speed of footwork are essential. There are six parries, and second intention attacks are much used.

Fencing more than almost any other sport has to be learned by actual practice under an instructor. Fencing competitions are judged by a jury consisting of a president, who directs the bout and alone decides on the validity of a hit according to the rules and conventions of fencing and as to the priority between two hits on time at épée, and four judges; two judges watch each competitor and advise the president when a hit is scored on the fencer they are watching.

In individual competitions, the competitors are drawn in pools of six or eight fencers at foil and sabre and eight to twelve fencers at épée. Every competitor fences against every other competitor in the pool in a pre-arranged order of bouts, and the classification is determined according to the number of victories awarded by the president to each fencer.

Teams usually of three to five fencers are drawn against each



other. Every member of one team fences against every member of the other team in a pre-arranged order of bouts. The result is determined by the number of victories (and if necessary the number of hits received and scored) by all the members of each team. Foil and sabre bouts are usually for the best of seven or nine hits. Épée bouts, formerly for one hit, are now usually for the best of three or five hits. The rules of the International Fencing Federation have been adopted by the Amateur Fencing Association for use in Great Britain.

**Fender.** Article of domestic furniture. Used as a guard against the falling of hot cinders from the

mins. at the Oval in 1922, and several times took over 100 wickets in one season. He wrote several books descriptive of international cricket, and was a prolific contributor to the press and a popular broadcaster on cricket.

**Fénelon, FRANÇOIS DE SALIGNAC DE LA MOTHE** (1651-1715). French ecclesiastic, author, and academician. He was born near Sarlat, Aug. 6, 1651. Ordained priest in 1675, he was director of the convent of the Nouvelles Catholiques, and missionary to the Protestants in the disturbed provinces of Poitou and Saintonges, the fascination of his personality, and his mixing of bribery and kindness, being great factors in his success.

boundaries should divide literature, politics, and religion; and his writings cover a wide range. The best

known is the didactic romance, *Les Aventures de Télémaque*, 1699, which, like his *Fables* and his *Dialogues des Morts*, was designed to instruct his



**François de Fénelon,**  
French prelate  
After Vivien, Louvre

royal pupil in the conduct of life and the responsibilities of absolute government. His *Éducation des Filles*, 1687, has also a place in the pedagogical literature of the time. Consult *Lives*, Viscount Saint-Cyres, 1906; P. E. R. Janet, Eng. trans. V. Leuliette, 1914.

**Feng-huang-cheng.** Town of N.E. Manchuria, China, in the prov. of Antung. On the Mukden-Antung rly., it was opened to international trade by agreement between China and Japan, 1905. Pop. 51,000.

**Feng-siang.** Town of China, in the prov. of Shensi. It is perched on a high loess terrace on the main road from Peiping to Lanchow.

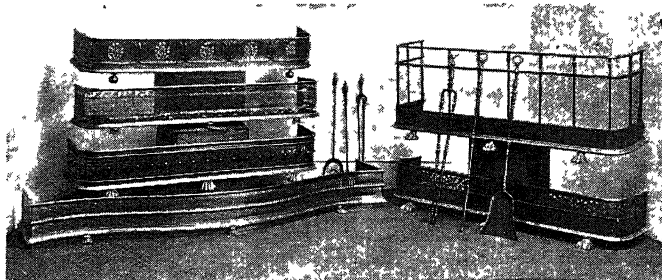
**Fengtien.** This portion of Manchuria is now the province of Liaoning (*q.v.*).

**Feng-yang.** City of China, in the prov. of Anhwei. It was the birthplace of the Mings, but the first emperor transferred his capital to Nanking.

**Fen-ho.** River of China, in the prov. of Shansi. It is a tributary of the Yellow River.

**Fenianism.** Name given to the revolutionary movement springing from the Fenian brotherhood. Its real name was the Irish Revolutionary Brotherhood. One of the organizers, O'Mahoney, gave it the name of the Fenian Society. This name was derived from the semi-legendary warrior bands (Fianna) of early Irish history. The society was really a political association of Irish and Irish-Americans whose object was to overthrow British government in Ireland and establish a republic there. There was an American branch and an Irish branch. It has been said that the movement began in America, but really the plans for both branches were drawn up in Paris by a band of Irish revolutionaries in 1848.

The Irish famines in the 'forties caused a great emigration to America, and the emigrants laid the blame for their exile on the British government, which had



**Fender.** Examples in domestic use. Steel and brass fenders of the 18th century  
By courtesy of Gull & Reigate

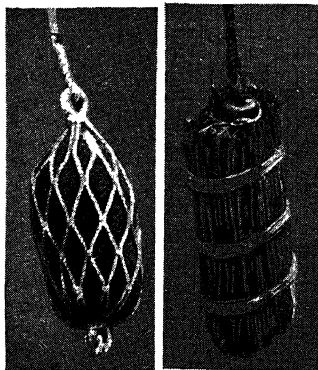
fire into the room, it came into use upon the introduction of grates raised from the floor, and it superseded the old shallow kerb which enclosed the open stone hearth. The growing popularity of sunken grates and tiled fireplaces in the 20th century has led to a lessening of the need for fenders and a reversion to the shallow curb, usually of tile material, or often no curb at all is used.

**Fender.** Nautical term for a bundle of sticks, rope, or wood dropped over a vessel's side to prevent her from rubbing against another vessel or the wall of a quay. Hence the expression to fend off, *i.e.* to keep away, to protect. A "pudding fender" is a large ball of old rope used as a fender.

**Fender, PERCY GEORGE HERBERT** (b. 1892). English cricketer. Educated at S. George's college, Weybridge, and S. Paul's school, he entered first class cricket in 1910, when he played for Sussex, and by 1914 was a member of the Gentlemen's XI against the Players. He toured Australia with the M.C.C. team in 1920-21 and South Africa in 1922-23. He captained Surrey from 1921 to 1932. Equally useful as a bowler and a fast scoring batsman, Fender made his highest score of 185 in 2 hrs. 10

In 1689 he was appointed preceptor to Louis XIV's grandson, the duke of Burgundy, and in 1695 was made archbishop of Cambrai. Soon after this his interest in quietism and defence of its leader, Mme. Guyon, brought him into collision with his old friend Bossuet, who, after a bitter controversy, obtained the condemnation by Rome (1699) of his offending volume *Explication des Maximes des Saints sur la Vie Intérieure*. Fénelon died Jan. 7, 1715.

Fénelon was a man of great versatility, who did not believe that



**Fender (nautical).** Left, rope fender in net; right, fender of hazel wood bound with wire

been painfully unsuccessful in its efforts to cope with distress. The sentiment of hatred towards England was fomented by James Stephens and others, who had escaped after the abortive Young Ireland insurrection of 1848. The organizers knew that open rebellion against the armed forces of the British government could bring only disaster, but were persuaded that justice could not be won by peaceful methods. Therefore they held it justifiable to foster "secret warfare"—which those who did not sympathise called outrage and assassination. Their aim was purely political; being neither religious nor agrarian, it appealed neither to the priesthood nor to the peasantry.

Stephens returned to Ireland to organize the society there while the real headquarters remained in America. In the American Civil War, which ended in 1865, numbers of American Irish had learnt the business of fighting. An active secret propaganda was set to work in Ireland; but the authorities seized the offices of "The Irish People," and arrested sundry ring-leaders. In 1866 some hundreds of American Irish attempted to



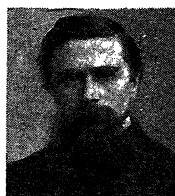
Fennec. Small fox found in the deserts of North Africa

raise an insurrection in Canada, but failed completely, receiving none of the support expected from the U.S.A. government. Another effort, however, had been prepared in England and Ireland. In Feb., 1867, a plan to seize the arsenal in Chester Castle was forestalled by drafting troops to that city.

In Sept., two Fenians were arrested in Manchester on charges of felony. A rescue was attempted, the prisoners escaped, and a police officer was killed, but 29 Fenians were arrested and three of them were hanged for the murder of the sergeant, which had not been intended, and of which the men convicted had been guilty only in a technical sense. These men

became known as the Manchester Martyrs. A worse crime was the blowing up of a part of Clerkenwell prison on Dec. 13. The brotherhood after this time became merged in other societies of a similar character, such as Clan-na-Gael (*q.v.*), and the Irish Republican Brotherhood. See Ireland, History.

**Fenn**, GEORGE MANVILLE (1831–1909). A British story-writer for boys. He was born at Westminster

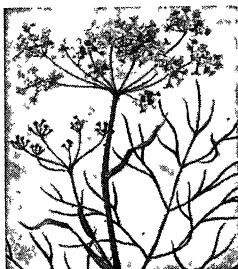


G. Manville Fenn, British novelist  
Elliot & Fry

Jan. 3, 1831, and educated at private schools. Having contributed to popular periodicals, he was in 1870 appointed editor of Cassell's Magazine, and in 1873 became proprietor of Once a Week. His published work totalled close upon 200 volumes and included numerous stories told in pleasant narrative style, among them being *The Sapphire Cross*, 1871; *The Parson o' Dumford*, 1879; *Off to the Wilds*, 1881; *Nat the Naturalist*, 1883; *Bunyip Land*, 1885; *The Bag of Diamonds*, 1887; *A Crimson Crime*, 1899. Fenn died Aug. 26, 1909.

**Fennec** (*Canis zerda*). Small foxlike member of the dog family, found in N. Africa. The ears are enormously long. The colour is a very pale buff, with white beneath and a black tip to the tail. Fennecs live in burrows in the desert and feed at night on birds, lizards, and small mammals.

**Fennel** (*Foeniculum vulgare*). Tall perennial herb of the family Umbelliferae. It is a native of Europe, N. Africa, and W. Asia. The leaves are much divided into thread-like segments. The tubular but almost solid stem is 3 ft.–4 ft. in height, crowned with compound umbels of minute yellow flowers. The fruits are compressed from side to side. The leaves are used as a pot-herb, and for garnishing dishes, and the fruit supplies an aromatic oil possessing carminative properties.



Fennel. Flower-head and leaf of *Foeniculum vulgare*

**Fenny Stratford**. This town of Buckinghamshire, England, is now part of Bletchley (*q.v.*).

**Fens**, THE. Extensive flat and low-lying region of England, 70 m. in length and

35 m. in extreme breadth, occupying parts of several counties in the neighbourhood of the Wash. They represent the silted up portion of a bay of which only the Wash is left, and systematic drainage at various periods has rendered them extremely fertile. The Romans attempted to drain the Fens by constructing causeways and throwing up immense embankments along the rivers and the seashore, but the sluices were gradually choked and the district again became water-logged, serious inundations by the sea occurring at intervals down to the second half of the 16th century.

In 1634, Francis, earl of Bedford, and thirteen co-adventurers employed a Dutch engineer, Vermuyden, to drain the area now known as the Bedford Level (*q.v.*). It was not until 1807, however, that the effectual draining of the entire region was finally accomplished, the Holland and neighbouring fens having been reclaimed in 1767, the Witham Fens in 1807, and the Welland Fens almost totally reclaimed by 1801. Grain, flax, cole-seed, and potatoes are extensively cultivated, and wild-fowl abound. The Fen country is the home of English skating. During the second half of the 7th century, Peterborough, Ely, Ramsey, Thorney, Crowland, etc., were settled by various monastic orders, who erected churches, monasteries, and abbeys. Great damage was caused by floods in the early spring of 1947.

**Fenton**. This parish of Staffordshire, England, is now part of Stoke-on-Trent (*q.v.*).

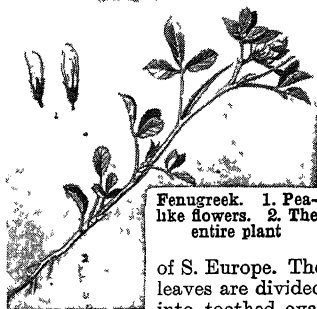
**Fenton**, LAVINIA (1708–60). An English actress. She made her first appearance in 1726 as Monimia in Otway's *The Orphan*. Her beauty, voice, and charm soon made her a reigning toast, and her success as Polly Peachum in Gay's *Beggar's Opera* (Jan. 29, 1728) at Lincoln's Inn Fields was such that the opera was played 62 times during the season. The 3rd duke of Bolton married her in 1751. She died on Jan. 24, 1760.



Lavinia Fenton, English actress  
After Hogarth

**Fents** (Fr. *fente*, slit). Remnants of cloth from one yard to a few yards in length. They are too short for sale in a regular way, and are generally sold by weight.

**Fenugreek** (*Trigonella foenum-graecum*). Annual herb of the family Leguminosae. It is a native



Fenugreek. 1. Pea-like flowers. 2. The entire plant

of S. Europe. The leaves are divided into toothed oval leaflets, flowers pea-like, white, on unbranched stems, 1 ft. to 2 ft. high. The plant, whose name means Greek hay, has the odour of new-mown hay, into which it was made by the ancients. The seeds are used in veterinary medicine.

**Fenwick, CHARLES** (1850–1918). British politician. Born at Cramlington, Northumberland, May 5, 1850, he worked on the pit-bank at the age of nine, and on his tenth birthday became an underground labourer. A miner until 1885, he educated himself in his spare time, and held offices under the Northumberland miners' association. He was elected to parliament as Liberal-Labour candidate for Wansbeck in 1885. He was secretary of the parliamentary committee on Trades Unions, 1890, and served on the parl. Coal Dust commission, 1891, and the royal commission on Secondary Education, 1894. He represented Wansbeck until his death, April 22, 1918.

**Fenwick, SIR JOHN** (c. 1645–97). English conspirator. Of an old Northumberland family, he early entered the army. Becoming major-general in 1688, he sat in parliament for his native county, 1677–85. Against William III Fenwick is said to have had an old personal



Sir John Fenwick, English conspirator  
From an engraving

grudge, perhaps reciprocated, and in 1696 he was arrested in connexion with an assassination plot. In his confession he cast aspersions on many prominent Whigs. He was attainted and beheaded on Tower Hill, Jan. 28, 1697.

**Feodor** OR **THEODORE** (1575–98). Tsar of Russia. The son of Ivan the Terrible, he was born

May 11, 1557, and came to the throne in 1584. Mentally deficient, he was never capable of ruling, and was under the direct influence of his brother-in-law, Boris Godunov, who, upon Feodor's death, Jan. 7, 1598, ascended the throne. Another tsar of the same name was half-brother of Peter the Great and was succeeded by him in 1682.

**Feodosia** OR **THEODOSIA**. Town and harbour on the E. coast of the Crimea, U.S.S.R. It lies 70 m. E. of Simferopol and can be reached by rly. from Kerch. The industries are connected with soap, carpets, leather, and caviare. An old colony of Miletus, about 1270 Feodosia became a Genoese emporium, but was taken by the Turks in 1475. Annexed to Russia in 1770, it was developed as a resort. In the Second Great War it was evacuated Nov. 5, 1941; retaken from the Germans Dec. 30; lost to them next month; and regained by the Russian Maritime Army, April 13, 1944.

**Fcoffment**. In England, the common law method of transferring a fee, or freehold. It was a symbolical placing of the transferee in possession of the estate by delivering it to him. If it were a house, the transferor might hand him the key of the front door. If it were land he would hand him, on the land itself, a sod, or a twig, saying, "I liver this to thee in the name of seisin of Whitacre, which is bounded by" (here he would name the boundaries of the estate), "to have and to hold to thee and thy heirs," or for life.

It became customary to set out the boundaries, etc., in a deed on parchment, sealed with the seal of the parties, and then the feoffment was somewhat in this form, "I liver this (sod, twig, etc.) to thee in the name of all the lands set out in this my deed," at the same time handing over the deed, charter of feoffment. The Statute of Frauds (Charles II) made some writing necessary on the sale of land; but livery of seisin or feoffment was still necessary as well. To evade the necessity for feoffment the device was introduced of employing two deeds, (1) a lease to the transferee, and (2) a release to him of the reversion. Neither lease nor release required feoffment. By the Real Property Act, 1845, conveyances of freeholds are made lawful by deed of grant.

**Ferber, EDNA** (b. 1887). American novelist and dramatist. Born at Kalamazoo, Mich., Aug. 15, 1887, she was educated at Appleton, Wis., and at 17 became a

reporter. Beginning her literary career as a short story writer, she achieved her first popular success (in collaboration with G. V. Hobart) with *So Big*, 1924, a representation of American provincial life which won the Pulitzer prize. Her novel *Show Boat*, 1926, dramatised and filmed, had brilliant runs in New York and London; *Cimarron*, 1930, was filmed. In collaboration with G. S. Kaufman she wrote plays notable for their wit and characterisation, which were equally successful as films, e.g. *Dinner at Eight*, 1932; *Stage Door*, 1936. Other books were *Saratoga Trunk*, 1941 (also filmed); *Great Son*, 1945.

**Ferberite**. The iron-rich end-member of the wolframite mineral group. Chemically it is iron tungstate,  $\text{FeWO}_4$ , with subordinate amounts of manganese. See *Wolframite*.

**Ferdinand I** (1503–64). German king and Roman emperor. Born at Alcalá de Henares, Spain, March 10, 1503, he was the younger son of the archduke Philip and of Joanna of Castile. He was thus a Hapsburg, a grandson of the emperor Maximilian and a



Ferdinand I, German king  
After Titian

brother of Charles V. After Charles was chosen emperor in 1519, Ferdinand was given territories in Germany and helped his brother in the work of government. In 1521 he married Anna, daughter of the king of Hungary and Bohemia, and when her childless brother Louis was killed in 1526 he put himself forward as his successor. In both lands he was chosen and crowned; but in Hungary he had for long little more than the name of king.

It is from Ferdinand, not from Charles, that the modern Hapsburgs are descended. The brothers agreed that on the elder's death Ferdinand should succeed him in Germany, leaving to Charles's son Philip only Spain and its colonies. Ferdinand, therefore, was chosen German king in 1531, and when Charles abdicated in 1556 the arrangement was carried out. In the intervening years Ferdinand was fighting for Hungary and dealing as best he could with the religious disorders in Germany and Bohemia. He was useful to Charles after the latter's humiliation at the hands of Maurice of Saxony, and arranged with the Protestants the peace of

Augsburg. His own reign as emperor (1558-64) saw but a continuance of his war with the Turks and of his efforts to settle the religious differences. He died in Vienna, July 25, 1564, his eldest son, Maximilian II, succeeding him.

**Ferdinand II** (1578-1637). German king and Roman emperor. Born at Graz, July 9, 1578, he



Ferdinand II,  
German king

*From an old engraving*

was a son of the archduke Charles and a nephew of he emperor Maximilian II. Educated by he Jesuits, he began his public life as ruler of Styria and Carinthia, the portion of the Hapsburg domains that had been his father's share. His rule was chiefly distinguished for his persecution of the Protestants. In 1612 the emperor Rudolph, Ferdinand's cousin, died, and another cousin, Matthias, became emperor. He was old and childless, and the outcome of much political strategy was the decision that Ferdinand, and not one of his own brothers, should succeed him. The family agreed to the arrangement, and as a beginning the archduke was chosen king of Bohemia and king of Hungary. Matthias died in 1619 and in Aug. his nephew was elected German king.

Meanwhile, in 1618, the Thirty Years' War had begun. A rival to Ferdinand, set up by the Protestants in Bohemia, kindled the flame, and the struggle lasted throughout the emperor's lifetime. Ferdinand acted vigorously, and until the appearance of the Swedes, aided by Maximilian of Bavaria, he was completely victorious. He recovered Bohemia, put an end as far as possible to Protestantism, and by the edict of 1629 gave back lands taken from the Church. The Swedish intervention followed, and in 1635 the emperor made the treaty of Prague with some of his foes. He died Feb. 15, 1637, leaving, by his wife, who was a Bavarian princess, two sons—his successor, Ferdinand III, and Leopold, a prelate. *See* Thirty Years' War.

**Ferdinand III** (1608-57). German king and Roman emperor. Son of the emperor Ferdinand II, he was born at Graz, July 13, 1608. To secure his position his father had him crowned king of Hungary and king of Bohemia during his own lifetime, and in 1636



Ferdinand III,  
German king

he was chosen German king. In 1637 his father died and Ferdinand became the real ruler of these kingdoms and assumed the title of emperor.

The Thirty Years' War, in which he had taken part, was then raging, and his reign saw its end in 1648. He died April 2, 1657, and was succeeded by his eldest surviving son, Leopold I.

**Ferdinand** (1861-1948). Tsar of Bulgaria. Born at Vienna, Feb. 26, 1861, he was the youngest son of Augustus, prince of Saxe-Coburg-Gotha, and Clementine, daughter of Louis Philippe. He was well educated, and with his brother Augustus published a book on his botanical observations in Brazil. He entered the Austrian army, but soon his ambition led him in another direction. In 1887 Alexander, prince of Bulgaria, abdicated, and after much intrigue Ferdinand was chosen as his successor. Russia was opposed to him, but he won through and by 1896 most of the objections to him had ceased. In 1908 he proclaimed the independence of Bulgaria, and called himself king or tsar, winning recognition from the powers shortly afterwards. He was an advocate of the Balkan League, and was one of the instigators of the war of 1912-13.

On the outbreak of the First Great War, Ferdinand was cautious enough to await developments before committing himself to any definite policy. His strong German tendencies gradually became more apparent, however, and finally, having exhausted all the prevarications of diplomacy, he declared war, Oct. 13, 1915. He played no conspicuous part in the war itself, and, on the final breakdown of the Bulgarian effort, he abdicated, Oct. 4, 1918, in favour of his son Boris, and retired to Germany. Ferdinand married in 1893 a daughter of the duke of Parma; and in 1908 a princess of Reuss. He died Sept. 10, 1948.

**Ferdinand** (1865-1927). King of Rumania. Born at Sigmaringen, Aug. 24, 1865, he was a son of

Leopold, a member of the non-reigning and Roman Catholic branch of the Hohenzollern family. In 1866 his uncle Charles had been chosen king of Rumania, and as his heir Ferdinand became king in Oct., 1914. The First Great War was then raging, but it was not until 1916 that Rumania joined in on the side of the Allies. The land

was soon overrun by Austro-Germans, and during the difficult period that followed there were rumours of the king's abdication; but these did not materialise, and the end of the war saw him again in possession of his country. He married in 1893 Marie, cousin of George V, and died July 20, 1927.

**Ferdinand**. Name of several kings of Spain and Naples. Other than those who are given separate biographies, the principal are Ferdinand I (d. 1065), El Magno, or the Great, who became king of Castile in 1028; Ferdinand II (d. 1188), king of Leon; and Ferdinand IV (d. 1312), king of Castile. Of the Neapolitan kings, Ferdinand I (1423-94) was the natural son of Alphonso V of Aragon and I of Sicily. He succeeded to the throne by the will of his father. His reign was troubled by the jealousy of the other Italian states, wars with the Turks, and difficulties with France. His grandson, Ferdinand II (1469-96), was temporarily dispossessed by Charles VIII of France. The Bourbon Ferdinand III (1751-1825), king of Sicily, welded the titles of Naples into one and became Ferdinand I of the Two Sicilies.

**Ferdinand III** (1199-1252). King of Castile and Leon, called the Saint. Son of Alfonso IX of Leon and Berengaria of Castile, he succeeded his cousin Henry as king of Castile in 1217, and showed himself a prudent ruler. In 1231 the death of his father brought him the throne of Leon, and as king of Castile and Leon he waged war against the Moors, confining them to Granada, and securing Seville in 1248. He was canonised by Clement X in 1671 on account of his unflinching orthodoxy in representing the Albigenses, and for his services towards the Crusades.

**Ferdinand V** (1452-1516). King of Spain. Known as Ferdinand of Aragon, he was the son of John II, king of Aragon and Sicily, and was



Ferdinand,  
King of Rumania



Ferdinand,  
Tsar of Bulgaria

born March 16, 1452. He was assigned the Sicilian kingdom in 1468, and succeeded his father as Ferdinand II of Aragon in 1479. In 1469 he had married Isabella, sister of Henry IV of Castile, the recognized heiress to the Castilian throne. Henry died in 1474, and Isabella was established as queen of Castile in 1479, the year in which Ferdinand succeeded to the crown of Aragon. There were now in the



Ferdinand V,  
King of Spain

*From a contemp. portrait*

Spanish peninsula five kingdoms: the Moorish dominion of Granada, Portugal, Navarre, Castile, and Aragon. The last two kingdoms were under one crown, though retaining separate governments. A long war with Granada ended triumphantly with its annexation in 1492; and in 1512 Ferdinand acquired almost all of Navarre.

Thus during his reign the entire peninsula, except Portugal, was brought under a single dominion. Sicily was already attached to the kingdom of Aragon, to which S. Italy or Naples was added by the ousting of the French in 1504. Further, the discovery of America, 1492, by Columbus, under the auspices of Ferdinand and Isabella, secured what was almost the monopoly of the New World to Spain, which had thus been raised to the position at least of equality with France. Isabella was something more than the partner of Ferdinand in the expansion of their joint dominion and in bringing each of their separate kingdoms under the effective control of the crown. She rendered ill service to Spain, however, by introducing the Inquisition (*q.v.*) in 1480. The expulsion of the Jews and the harsh restrictions imposed upon the Moors were also highly injurious. The course of future events was greatly influenced by the marriage of the elder daughter Joanna to Philip, duke of Burgundy, heir to the Austrian Hapsburgs, and of the younger, Catherine, to Henry VIII of England, after her betrothal to his brother Arthur, prince of Wales.

Ferdinand was noted as the craftiest sovereign of his day, his only rival in that quality being Henry VII of England, with whom he was usually joined in an alliance in which each sought the maximum advantage at the other's expense. After the death of Isabella, 1504, Ferdinand's craft degenerated

into mere cunning. The crowns of Castile and Aragon were actually parted when Isabella died; but Joanna, duchess of Burgundy, was heiress of both, and her place was taken by her son, afterwards Charles V. Except during a brief interval, Ferdinand retained the government of Castile as regent until his death, Jan. 23, 1516. The character of Ferdinand is summed up in the story of his reply when told that Louis XII complained that he had cheated him once. "He lies: I have cheated him thrice." *Consult History of the Reign of Ferdinand and Isabella*, W. H. Prescott, ed. J. F. Kirk, repr. 1902.

**Ferdinand VI** (1712-59). King of Spain. The second son of Philip V, he was born Sept. 23, 1712, and ascended the throne in 1746. He immediately set himself to carry out internal reforms, having first concluded the peace of Aix-la-Chapelle, 1748. At the outbreak of the Seven Years' War in 1756 he declared his neutrality. Three years later, broken-hearted at the loss of his wife, Maria of Portugal, his reason gave way, and he died Aug. 10, 1759. The crown of Spain passed to his half-brother, Charles III of Naples.

**Ferdinand VII** (1784-1833). King of Spain. Son of Charles IV, he was born Oct. 14, 1784, and five



Ferdinand VII,  
King of Spain

years later became prince of Asturias. In opposition to his father, in 1806 he approached the court of France with the project of marrying one of Napoleon's nieces. He was imprisoned by his father, but the French invasion of Spain caused the latter to abdicate in Ferdinand's favour in 1808. Charles, however, appealed to Napoleon, and withdrew his abdication, and Ferdinand went into retirement. After the Peninsular War in 1814 Napoleon reinstated Ferdinand. A reign of terror followed, and such chaos and rebellion prevailed that in 1823 a French army was sent to establish Ferdinand on his throne. To secure the succession for his daughter, Isabella, in 1830 he abolished the Salic law as applying to the Spanish throne, thus excluding his brother Carlos, an act which led to grave complications later. He died Sept. 29, 1833, and Isabella came to the throne under the regency of Maria Christina. *See* Carlists; Spain; History.

**Ferdinand I** (1751-1825). King of the Two Sicilies. Born in Naples,



Ferdinand I, King  
of the Two Sicilies

Jan. 12, 1751, when his father ascended the Spanish throne as Charles III in 1759, he became his successor as king of Naples and of Sicily. In 1768 he married Maria Carolina of Austria, and was completely dominated by her violent and tyrannical nature.

After the short-lived Parthenopean Republic (1799), in the bloody repression of which Nelson, deluded by Lady Hamilton and Maria Carolina, played a part, Ferdinand oppressed his subjects still more. He aided the Austrians against Napoleon, who sent troops to occupy Naples, whereupon Ferdinand fled to Sicily, and Joseph Bonaparte was proclaimed king in his place. In 1815 Murat, who had succeeded Joseph as king in 1808, was deposed, and Ferdinand returned to vent his spite on the populace by the indulgence of an inconceivable tyranny and cruelty. Uniting Naples and Sicily, he became the first king of the Two Sicilies. At the suggestion of the European powers he promised various reforms, but consistently with the whole tenor of his life he broke all his oaths and repudiated his own signature. He died on Jan. 4, 1825.

**Ferdinand II** (1810-59). King of the Two Sicilies. Born at Palermo, Jan. 12, 1810, he suc-



Ferdinand II, King  
of the Two Sicilies

ceeded to the throne at the age of 20, inaugurating his reign with the promise of many reforms. His despotic and cruel nature soon showed itself, however, and before long the kingdom was groaning under oppression and corruption. The insurrections of 1837, 1843, and 1844 culminated in a rising in Sicily and Naples, 1848, which terrified him into granting a constitution. The crushing of Italian hopes after Novara, 1849, encouraged him to annul this, and in order to quell the revolutionary spirit he caused Messina and Palermo to be bombarded, thus earning the nickname of King Bomba. Those who showed liberal tendencies were imprisoned to the number of about 30,000 under

conditions which Gladstone, who visited the country in 1851, exposed, describing Ferdinand's rule as the "negation of God." He died May 22, 1859.

**Ferdinand** (1769-1824). Grand duke of Tuscany. Born May 6, 1769, he was a younger son of the emperor Leopold II. In 1790, when his father became German emperor, he succeeded to the grand duchy of Tuscany. In 1799 he was deposed by the French, in 1802 was made elector of Salzburg, and in 1806 became grand duke of Würzburg. He was restored to his Tuscan throne in 1814, and by his liberal government saved his people from the misfortunes which overtook their neighbours on the restoration of the old monarchies. He died June 18, 1824.

**Ferentino** (anc. *Ferentinum*). City of Italy, in the prov. of Frosinone. It stands on an eminence at an alt. of 1,290 ft., 43 m. by rly. E.S.E. of Rome. It has extensive remains of the fortifications of the ancient city, including two gateways. It has a fine cathedral with mosaic floors—the aisle was damaged by a shell in the Second Great War—and there are a few Gothic churches. The town trades in oil and wine.

**Ferg**, FRANZ DE PAULA (1689-1740). Austrian painter. Born at Vienna, he studied under his father, Pancrazius Ferg, J. Orient, and Jean Graff, and painted landscapes in the manner of Poelenberg and genre in the Flemish style. After some years at the court at Dresden, he visited Brunswick, and then London, where, after enjoying some years of affluence, he died in poverty.

**Ferghana**. Town in Khokand district of Uzbek S.S.R. It lies 10 m. S.E. of Marghelan, in the Ferghana valley, and is reached by branch rly. from Andijan or Khokand. Cotton-growing in the district was expanded in the 1930s, and petroleum wells provide the other main industry. The fertile Ferghana valley yields a variety of fruits, nuts, and herbs. Historically, Ferghana has been the name of a province, which was annexed by Russia in 1876. Pop. of town, pre-war, 35,000.

**Fergus**. River of Eire. It rises in the N.W. of co. Clare and flows generally S. for 25 m. to its estuary at Clare village. The estuary, about 10 m. long and 4 m. in extreme breadth, is dotted with islands and contains salmon.

**Ferguson, ADAM** (1723-1816). Scottish philosopher. Born at Logierait, Perthshire, June 20,

1723, he was educated at Perth and the university of St. Andrews. He became an army chaplain, and was present at Fontenoy with the Black Watch. In 1759 he was chosen professor of natural philosophy at Edinburgh, and retained his post there until 1785, and lived until Feb. 22, 1816. Ferguson is known by his *Essay on the History of Civil Society*, and the belief in progress towards perfection elaborated in his *Institutes of Moral Philosophy*, 1772, and *Principles of Moral and Political Science*, 1792.

**Ferguson, JAMES** (1710-76). Scottish astronomer. Born April 25, 1710, near Rothiemay, Banffshire, he attended Keith grammar school, but at 10 years old he became a farm hand, and looked after sheep, studying the stars at night. He returned home broken in health, but his ingenious construction of a clock attracted the patronage of Sir James Dunbar. In 1734 he went to Edinburgh, where he painted miniatures. In 1743 he removed to London, and was elected F.R.S. in 1763. He became a popular lecturer on experimental science, but was specially noted as an inventor of astronomical and other instruments. He died Nov. 16, 1776.

**Ferguson, ROBERT** (c. 1637-1714). Scottish conspirator and pamphleteer, known as "the Plotter." Born in Aberdeenshire, he came to England about 1655, and was appointed to the living of Godmersham, Kent, from which he was ejected in 1662 by the Act of Uniformity. He took part in the various plots against Charles II, James II, and William III, but always succeeded in escaping from justice.

**Ferguson, SIR SAMUEL** (1810-86). An Irish poet and antiquary. Born at Belfast, March 10, 1810, and educated at Trinity College, Dublin, he was called to the Irish bar in 1838. Deputy keeper of the public records of Ireland in 1867, he was knighted in 1878. He died



James Ferguson,  
Scottish astronomer.  
From a print

Aug. 9, 1886. His poems, for the most part metrical versions of Irish legends, comprise *Lays of the Western Gael*, 1865; *Congal*, an epic poem, 1872; and a second volume of lays, *Poems*, 1880. He helped to prepare the way for the Gaelic revival.

**Fergusson, JAMES** (1808-86). Scottish writer on architecture. Born at Ayr, Jan. 2, 1808, he was educated in Scotland, and became a merchant in India, where he made a study of its architecture, his first book on the subject, *The Rock-cut Temples of India*, being published in 1845. His outstanding work was his *General History of Architecture*, 1865-76; his non-historical works included *The True Principles of Beauty in Art*. He died Jan. 9, 1886.

**Fergusson, JOHN MOORE** (1863-1944). Scottish divine. A descendant of Sir John Moore, general at Corunna, he was born at Doune, Perthshire, and educated at St. Andrews and Edinburgh universities. Ordained to Rook Ferry, Cheshire, in 1888, he later served at Woolwich, Southend, Wallington, and Dulwich. He was moderator of the general assembly of the Presbyterian church of England, 1932-33. Fergusson was killed in an air raid, July 4, 1944.

**Fergusson, ROBERT** (1750-74). Scottish poet. Born in Edinburgh, Sept. 5, 1750, he studied at St. Andrews university, and entered the office of the commissary clerk at Edinburgh. In 1771 he began to contribute poems, mostly in the Scottish dialect, for *Ruddiman's Weekly Magazine*, and these appeared in collected form in 1773. He died Oct. 16, 1774. His work greatly influenced Burns, who in 1789 composed the epitaph for the headstone of his grave in Canon-gate churchyard.

**Feriae**. Sacred festivals or holidays of ancient Rome. The most important were the *Feriae Latinae*, the great Latin festival. During the holding of the *feriae* the city was in charge of special officials and no business was done. See *Festival*.

**Ferial and Festal**. Terms used in music. In the Christian Church *ferial* signifies any day not specially observed either as *festal* or *penitential*, and the music is of a simpler order on *ferial* than on *festal* days.

**Feringhi** (Pers. *farangi*). Corruption of Frank, the name given by Asiatics to a European. It is now used as a term of contempt.

**Fermanagh**. Inland county of N. Ireland. The irregular surface is marked by numerous hills, the



Sir Samuel Ferguson



highest of which, wholly within the county, is Belmore (1,312 ft.). Lough Erne consists of two lakes—Upper and Lower—respectively about 15 m. in length and 4 m. in breadth, and about 20 m. in length and at widest about 7 m. in breadth. Upper Lough Erne narrows into two channels round the island on which Enniskillen, the county town, is built. Agriculture is the principal industry. Coal,

integers which will satisfy the equation  $x^n + y^n = z^n$  where  $n > 2$ ) have led to some of the most fruitful developments in number theory. A councillor for the Toulouse parliament, Fermat died Jan. 12, 1665.

**Fermentation** (Lat. *fervere*, to boil). Result of the action of organic substances known as ferments. In 1680 the Dutch microscopist Leuwenhoeck showed that yeast consists of definite globules,

ments are nitrogenous organic substances whose activity is destroyed by high temperatures.

The term ferment was at first applied both to the substances which could be extracted from plant and animal material, and which could break down specific compounds, and also to micro-organisms such as yeasts, bacteria, moulds, etc. Nowadays it is rarely used: micro-organisms are spoken of as ferments, but the term *enzymes* denotes the catalytic substances in all living material.

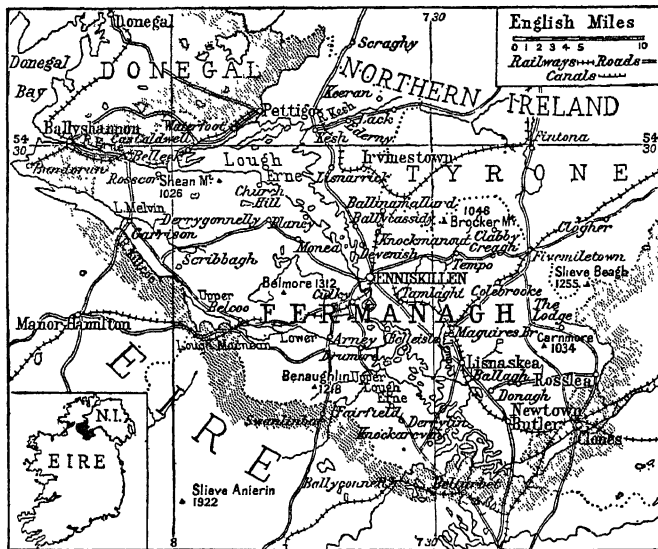
#### **Mucor, Rhizopus, and Penicillium**

At one time any fungal growth on organic material was spoken of as a mould, but in later nomenclature the term was restricted to forms such as *Mucor* (the white mould appearing on damp bread) and the closely related *Rhizopus*, distinguished by its black sporangia; also *Penicillium*, the ubiquitous bluish-green mould present on cheese, jam, bread, etc. *Aspergillus* is often associated with it. The red so-called baker's mould is *Neurospora*. (See Mould.)

**YEASTS.** Also called saccharomycetes because they live mostly in saccharine solutions, converting sugar into alcohol, yeasts form a group of micro-organisms of the greatest importance in fermentation. Yeast cells are round or oval in shape, and multiply by the process known as gemmation or budding, which goes on indefinitely under proper conditions. Otherwise they form spores or new cells liberated by the dissolution of the mother cell.

Although the cells can use oxygen, they appear to be independent of an environment of free oxygen. Time, strength of saccharine solution, and temperature also influence the process of fermentation. The alcohol formed retards the growth of the yeast cell, which ceases to act when above 20 p.c. of alcohol is formed.

Alcoholic or vinous fermentation is the characteristic function of yeasts. Ethyl alcohol (ordinary alcohol) is formed when sugar is fermented. The higher alcohols, propyl, butyl, amyl, and capryl alcohols, are also produced under suitable conditions. Fernbach discovered means of increasing the proportion of amyl alcohol produced during fermentation. Various forms of starch are used as the source of sugar, which is formed by the action of diastase in the process of brewing. Probably all forms are converted into glucose before fermentation proper. (See Alcohol; Rubber.)



Fermanagh. Map of this Northern Ireland county. The inset shows its position in relation to the rest of Ireland.

iron, and building stones are found. Three members are returned to the parliament of N. Ireland, and a joint constituency of Fermanagh and S. Tyrone returns one member to the imperial parliament. Tumuli, raths, castle ruins, and a round tower are among the antiquities. The round tower on Devenish Island in Lough Erne, one of those used as belfries and store-houses for the preservation of monastic treasures during the Danish invasion, with its beautiful carving of the pilaster quoins, retains its original beauty and perfection to a remarkable degree. Area, 653 sq. m. Pop. 54,569.

**Fermat, PIERRE DE** (1601-65). French mathematician, born Aug. 17, 1601, near Montauban. He published nothing in his lifetime, but his posthumous notes on Diophantus enunciated a number of propositions about integers which he claimed to have proved. Proofs for all except the last have since been found, and form the foundation of the modern theory of numbers. Attempts to prove the last (that there are no non-zero

but only in 1836 was it settled that yeast cells originated fermentation.

Latour first observed that the cells were living organisms, and his "vital hypothesis," violently opposed by Liebig, was supported by Pasteur, who in 1857 gave it as his opinion that "the chemical action of fermentation is essentially a correlative phenomenon of a vital act, beginning and ending with it. I think that there is never any alcoholic fermentation without there being at the same time organization, development, multiplication of globules, or the continued consecutive life of globules already formed." In fermentation the amount of matter consumed and changed into other compounds is much greater than the size and weight of the organisms responsible. Yeast globules decompose many times their weight of sugar and produce a relatively large quantity of alcohol and carbon dioxide. Experimental work has thoroughly determined the action of ferments, and also that each particular organism has its special products of fermentation. All fer-

The chief yeasts are: (1) *Saccharomyces cerevisiae*, the ordinary yeast of the brewer and distiller. Two kinds are recognized, "top" and "bottom" yeast, the former rising to the top of the liquid during fermentation and the latter forming a sediment in the vats. Top yeast is used in English ale fermentation, bottom yeast producing the lighter lager beer.

(2) *Saccharomyces ellipsoideus* is the ordinary ferment of vinous fermentation by which "must" or grape juice is converted into wine. (3) *Saccharomyces pastorianus* also occurs in wine-making, and when present during brewing gives a bitter taste to the beer. (4) *Saccharomyces mycoderma* is the cause of "mother" which appears on the surface of wine or beer after exposure for some days to the air.

Hansen, the Danish brewing chemist, isolated and cultivated the two pure yeasts, varieties of *Saccharomyces cerevisiae*, by using which it is possible to obtain beers of distinctive properties.

**ACETIC FERMENTATION.** It has long been known that when wine is exposed to the air it sours—turns into vinegar—and the manufacture of vinegar wort is an old-established art. It is essentially an oxidation process, and Pasteur first detected the organism, "flowers of vinegar," *Bacillus aceti*, which effects the change. Hansen detected two distinct species with the same properties. Both require oxygen for their growth, most favoured by a temperature of 33° C.

Lactic fermentation produces sour milk. The milk sugar is first split up into lacto-glucose and then into lactic acid by the agency of *Bacillus acidilactici*. A special bacillus, named *Bacillus caucasicum*, was found by Metchnikoff to be present in the soured milk called "yoghourt."

Viscous fermentation, due to *Pediococcus cerevisiae*, is the cause of "ropiness" in brewing, and a similar condition in bread-making.

#### Nitrification in Agriculture

Nitrification or the oxidation of ammonia into nitrous and nitric acids takes place through the agency of bacteria. Warington's investigations at Rothamsted showed the importance of nitrification in agriculture. Special preparations of nitrification bacteria are used commercially to promote the growth of leguminous plants.

**ENZYMES** These organic catalysts may be defined as substances produced by living organisms, which initiate or hasten reactions

between organic and inorganic compounds. They are classified according to the class of compounds on which they have effect.

*Esterases* act on carbohydrates and include those acting on complex molecules such as starch, i.e. diastase (almost universally distributed in animals and plants) and cellulose, i.e. cellulases and cytases. True cellulases are found only in a few fungi and bacteria, but cytases occur in most fungi and also in the seeds of many flowering plants and conifers. The commonest enzymes acting on sugars, and thus producing glucose, are invertase and maltase, both widely distributed in plants and animals.

*Lipases* act on fats, converting them into fatty acids and glycerin. The best known is lipase, which is found in the pancreatic juice of mammals and in various plant tissues.

Enzymes affecting proteins are known as *proteolases* and include the coagulating enzymes found in blood and proteolytic enzymes such as pepsin and trypsin (found in animal digestive juices), papain from *Carica papaya*, and a number of enzymes from plant tissues. Proteolytic enzymes assist in the breakdown of proteins into peptones and peptides, and finally into amino-acids.

*Zymase*, from yeast, is a battery of enzymes acting on a variety of compounds.

#### Enzymes in Industry

Enzymes play a part in such industries as brewing and leather making. In the preparation of rubber, the drying of tea, and the curing of tobacco the proper treatment of the vegetable enzymes contained in these substances determines the quality of the products. In drying drugs the activity often depends upon the prompt killing by heat of the enzymes in the plants. Special processes have been evolved in which the vapour of boiling alcohol is employed for this purpose.

**PUTREFACTION.** This is the process of breaking down nitrogenous organic matter, especially proteins, accompanied by the production of evil-smelling gases. The process is due to micro-organisms, the decomposing substances yielding, among other organic bases, methylamine, tri-methylamine, and the important bodies known as ptomaines. Many ptomaines are very poisonous. Produced readily in decaying meat and fish, when introduced into the human body they give rise to serious blood poisoning.

See Brewing; Distilling; Enzyme; Liebig; Pasteur; Yeast.

**Fermi, ENRICO** (b. 1901). Italian physicist. Born at Rome, Sept. 28, 1901, he was educated at Göttingen and Leyden universities, and was appointed to the chair of physics at Florence, 1924, and Rome, 1926. In 1934 he succeeded in breaking heavy uranium atoms into the comparatively small atoms of lanthanum. At the time, however, Fermi imagined that he had merely repeated Rutherford's experiment of chipping small pieces off the atomic nuclei. In 1938 he was awarded the Nobel prize for physics and in 1942 received the Hughes medal of the Royal Society for his research in artificial radio-active substances. Some time before the Second Great War, he went to live in the U.S.A., where he ultimately joined the team of scientists responsible for the atomic bomb.

**Fermo** (anc. *Firmum Picenum*). City of Italy, in the prov. of Ascoli Piceno. It stands on an eminence, rather more than 1,000 ft. high, 4 m. from the Adriatic and 36 m. by rly. S.S.E. of Ancona. Enclosed by battlemented walls, it contains a 13th century cathedral, a town hall, and library, besides remains of Roman buildings. Porto San Giorgio, its port, exports grain, wool, and silk. Fermo was founded by the Romans in 264 B.C. and was a free city from 1199 to 1550, when it fell to the papacy. Pop. 20,000.

**Fermoy.** Urban dist. and market town of co. Cork., Ire. It stands on the Blackwater, 21 m. N.E. of Cork by Ire state rlys. Its importance is chiefly due to the efforts of John Anderson, a Cork merchant, who began to build here in 1791, and later gave a site for the erection of military barracks and founded Fermoy college. The town contains a Roman Catholic cathedral and S. Colman's Roman Catholic college. Salmon and trout fishing is plentiful and a trade in flour is carried on. There are a racecourse and a golf course in the vicinity. Fermoy was the scene of rioting on June 28–29, 1920, when the military wrecked a number of buildings as reprisal for the capture of General Lucas. Market day, Sat. Pop. 9,647.

**Fern** (*Pteridophyta*). A member of the largest and most highly developed group of flowerless plants (Cryptogamia). The *Pteridophyta* include, besides ferns, horsetails, club mosses, and a number of fossil plants. Most are perennial herbs, a few being

shrubby and tree-like, and all possess a well-developed vascular system often of a most complicated net-like nature.

The life history of the Pteridophyta is an example of the so-called alternation of generations in which there are two distinct types of plant, one bearing the sexual organs and the other sporangia. Spores from the latter develop into plants bearing sexual organs whilst the products of sexual fusion develop into spore-bearing plants. The conspicuous fern plant bears on the backs of its leaves small brown patches which consist of innumerable sporangia. When mature these dehisce and scatter hundreds of microscopic spores into the air. If these land on suitably damp soil the spores germinate into small scale-like bodies known as prothallia. The latter bear the sexual organs (archegonia and antheridia) on the under surface. When ripe the archegonia extrude an attractive substance towards which the male elements from the antheridia swim. One male element (spermatozoid) enters each archegonium and fuses with the egg within. The resultant embryo develops a root and leaves and assumes the familiar fernlike appearance.

From the gardener's point of view hardy ferns are valuable to fill moist, shady places for which the choice of flowering plants is limited, but the use of exotic ferns, except as specimens, or in elaborate winter gardens, has fallen into disuse, since some consider that space can be employed to greater advantage by flowering plants. This is purely a matter of taste; the beauty of the fern is lasting, that of the flower ephemeral.

#### Suitable Soil and Situation

Hardy ferns are not particular as to soil, though to obtain the best results a mixture which contains a considerable percentage of decayed leaf-mould or peat is desirable, or, failing this, some old stable manure should be mixed with the loam when making up the bed. The situation is more important; the north side of a wall or hedge, where less hardy things are difficult to grow, will suit ferns admirably. It is well not to plant them too near ivy, however, as this climber is so greedy a feeder that it speedily takes all the nourishment away from the ferns, especially if they are of choice kinds. The ordinary brake fern, or bracken, will grow anywhere, but except for very smoky and shady town gardens, its employment in

any quantity is not recommended as it is a greedy feeder.

Exotic ferns should be taken in hand in early spring, when the new growth starts. They will thrive in any ordinary potting mixture, one which contains a liberal admixture of silver sand for preference, and they may be shifted into larger pots when necessary, at any time of the year except winter. Ferns are most easily increased from spores, which are found upon the undersides of the leaves. When these are ripe the most fruitful leaf or leaves should be severed from the parent fern, and stored away in a box or piece of paper for a few days, and kept dry until the spore cases burst. The spores should then be lightly sown upon the surface of a box of finely sifted potting soil, and kept moist. Tiny ferns will appear, developing from prothallia, and these should be very carefully potted into thumb-pots when large enough to handle, and afterwards repotted as desired.

#### Maidenhair and Ribbon Ferns

When ferns such as the maidenhair, ribbon-fern, or any of the native species have been grown in the greenhouse, it will be found that the top-soil of the pots is already sown with their spores. If this is removed to a shallow pan and covered with glass, it will soon be covered with prothallia. Observation of the evolution of the adult fern from this beginning is a valuable lesson in botany.

Gold and silver ferns are popular names given to several species to denote their appearance. It is due to the under surface of the leaves being coated with fine particles of white or yellow wax, which looks silvery or golden. *Cheilanthes argentea*, an Asiatic species, is an example of a silver fern. Others of the same genus are *C. clevelandi* (N. America), *C. lanosa* (Western U.S.A.), and *C. myriophylla* (tropics). The genus *Ceropteris* also affords examples of

silver ferns in *C. chrysophylla* (tropics), *C. decomposita* (S. America), and *C. sulphurea* (W. Indies).

**Bibliography.** Structure and Development of Mosses and Ferns, D. H. Campbell, 1895; Wayside and Woodland Ferns, with Figures of British Species, E. Step, 1908.

**Fernandez, JUAN** (c. 1536–1602). Spanish navigator. A native of Cartagena, Fernandez spent his life as a pilot on the Pacific coast. In 1571 he discovered the island now called by his name, on which he vainly tried to settle some Indians. His skill as a sailor won him the nickname of the wizard, and also brought him to the notice of the Inquisition. See Juan Fernandez.

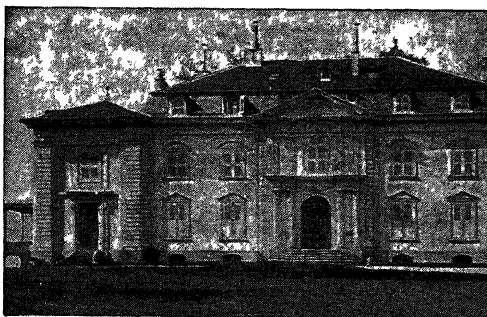
**Fernando de Noronha.** Island in the Atlantic, belonging to Brazil. It is about 200 m. E.N.E. of Cape St. Roque, 8 m. long by 1½ m. wide, is of volcanic origin, reaching an elevation of 1,100 ft., and has several good harbours protected by forts. The surface is rugged, but fertile, producing cereals, cotton, and fruit. At Remedios is a convict settlement, with a cable and wireless telegraph station. The island was discovered by a Portuguese navigator, whose name it bears. It is a landing point for aeroplanes between Europe and S. America. Pop. 1,200.

**Fernando Po.** Island in the Bight of Biafra, belonging to Spain. The key to this portion of the African coast, it is mountainous and fertile. Of volcanic origin, it is 35 m. long and 22 m. broad. Densely forested and covered with luxuriant vegetation, it yields sugar-cane, bananas, and yams, while cotton, coffee, rice, tobacco, and cinchona are cultivated. The highest mt., Clarence Peak, is 10,190 ft. The island is inhabited by a Bantu tribe, the Bubis, and a few negroes.

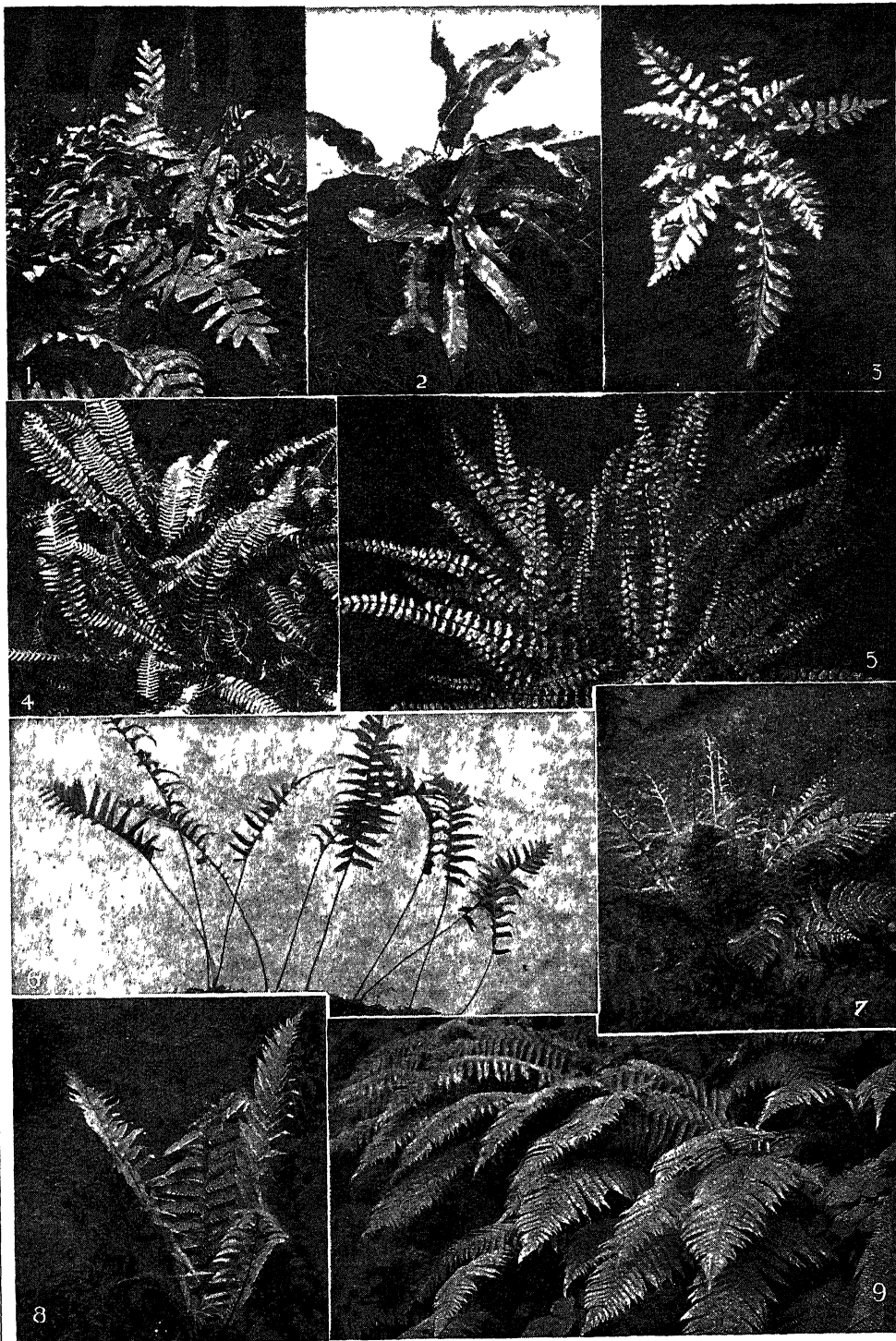
Santa Isabel, the chief town, is the administrative capital of the Spanish possessions in the Bight of

Biafra. Rubber and palm oil are exported. The climate is unhealthy. The island is named after Fernão do Po, its Portuguese discoverer in 1471. It was ceded to Spain in 1778. Area about 800 sq. m. Pop. 26,405.

**FERNÉY** or **FERNÉY-VOLTAIRE.** Village of France, in the dept. of



Ferney. The château built by Voltaire in 1758, which was his home for twenty years



1. Royal fern, *Osmunda regalis*. 2. Hart's-tongue, *Scolopendrium vulgare*. 3. Sea spleenwort, *Asplenium marinum*. 4. Hard fern, *Blechnum spicant*. 5. Maidenhair spleenwort, *Asplenium trichomanes*. 6. Common polypody, *Polypodium vulgare*. 7. Lady fern, *Athyrium filix-foemina*. 8. Male fern, *Dryopteris filix-mas*. 9. Prickly shield fern, *Athyrium aculeatum*

**FERN: SPECIES FOUND IN THE BRITISH COUNTRYSIDE**

Ain. It stands near the Swiss frontier, 4 m. N.W. of Geneva. The château de Ferney was built by Voltaire, who lived in it from 1758 to 1778; it contains numerous memorials and personal relics of the philosopher, who in 1768 founded a watch factory, which at one time employed 800 hands. In the town hall is a statue to Voltaire (*q.v.*), and his name was officially added to that of the town in 1878.

**Fernie.** City of Canada, in extreme S.E. of British Columbia. It lies 650 m. E. of Vancouver on the C.P.R., is on the Elk river, and is a tourist centre for the Kootenays. Coal mining is carried on, and the city owns its light, power, and water systems. Pop. 2,513.

**Fern Owl.** This bird is more commonly called the nightjar (*q.v.*).

**Fern Palm** (*Cycas revoluta*). Tree-like perennial of the family Cycadaceae. A native of China, it has a stout stem, in old individuals as much as 7 ft. high, crowned by the arching, palm-like leaves. These are cut into narrow segments in a feather-like manner, and vary in length from 2 ft. to 6 ft. The reproductive organs are found in the heart of the leaf-crown: the males in cones, whose scales bear anthers on their under surface; the females bearing ovules in the marginal notches of woolly, leaf-like organs.

**Ferns.** Town of Eire, in co. Wexford. It stands on the Bann, 74 m. S. of Dublin by rly. Its interest is wholly historical. It is the seat of R.C. and Protestant bishops. Buildings of interest are the two cathedrals, the episcopal palace, ruins of a Norman castle, of a church, and a monastery. The town grew up around a monastery founded by S. Edan about 600. The kings of Leinster had a palace here. The Protestant diocese was united with Ossory in 1836. James I made Ferns a chartered town, and until 1800 it sent two members to the Irish parliament. Pop. 1,576.

**Ferozepore.** District and town of W. Punjab, Pakistan. The area of the district is 4,085 sq. m. There are no important manufactures; the chief crops are wheat, grain, barley, and millet. Half the cultivated area is irrigated. Ferozepore town, founded in the 14th century, is situated at the junction of the Rajputana and North-Western rlys., some 4 m. from the Sutlej. It is the centre of a considerable grain trade. Battlefields of the Sikh War, 1845-46, lie to the E. Pop. of dist., 1,423,076, Hindus, Sikhs, Muslims; town, 72,000.

**Ferozeshah,** BATTLE OF. British victory in the first Sikh War. On Dec. 21, 1845, Sir Hugh Gough, who had just won the victory of Moodka, advanced against the Sikhs, and after a violent cannonade attacked with his infantry. The first British attack was repulsed with heavy loss. In the second effort the Sikhs were routed, losing 73 guns. See Sikh Wars.

**Ferragus,** FERRACUTE, FERRAUTE, OR VERNAGU. Giant of early French romances. In the Charlemagne legends he overcomes all that monarch's paladins except Roland, by whom he is slain. In Ariosto's Orlando Furioso he is a Saracen who throws away his helmet, declaring that he will never wear another until he has won that of Orlando, by whom he is killed.

**Ferranti,** SEBASTIAN ZIANI DE (1864-1930). An English scientist, born at Liverpool, April 9, 1864. He devoted his life to the improvement of existing methods of supplying and measuring electrical power. In 1882 he patented the Ferranti alternator, and then invented the electrical meter bearing his name. The Ferranti meter consists of an electro-magnet containing a thin disk of mercury, and the rotation of the disk serves as a measure of the strength of the current passing through the meter (see Meter, Electrical). In 1886 he set up his own generating station in Liverpool, and in 1892 founded the Ferranti electrical engineering works at Hollinwood, Lancs. He was president of the Institute of Electrical Engineers, 1910-11, and was elected F.R.S. in 1927. He died Jan. 13, 1930.

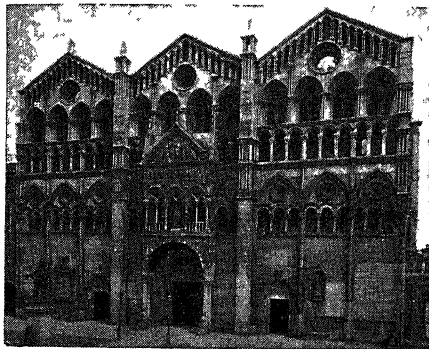
**Ferrar,** NICHOLAS (1592-1637). English theologian and founder of the Little Gidding community. Son of a London merchant, he was educated at Clare Hall, Cambridge, and worked for the Virginia Company, 1619-23. He was elected to parliament, but in 1625 retired, with his mother and brother-in-law, Collet, and their families, to the manor of Little Gidding, Hunts, to a secluded life of devotion, study, and good works. In 1626 he was ordained deacon by Laud. He died Dec. 4, 1637.

The members of Little Gidding household were famed for their skill in embroidery, bookbinding,

and "scrap book" making, and examples survive in the British Museum and elsewhere of cunningly constructed "harmonies," or "concordances" of the Bible, illustrated with prints collected by Ferrar on his travels. The "Arminian Nunnery" was twice visited by Charles I, and was broken up by the Puritans in 1647; it figures in J. H. Shorthouse's John Inglesant, and in Izaak Walton's Life of George Herbert.

**Ferrar,** ROBERT (1500-55). English martyr. He studied at Oxford and later was head of a religious house in Yorkshire, but became prominent on the accession of Edward VI. Owing to the influence of Somerset he was made bishop of St. Davids. He was a zealous reformer, but charges were brought against him, and Somerset having fallen from power, he was imprisoned in 1552. In 1554 his bishopric was taken from him, and he was put on his trial. Found guilty, he was burned at Carmarthen, March 30, 1555. The chief charge against him was that he had violated his vow of chastity by marrying.

**Ferrara.** Prov. of N.E. Italy. It is bounded N. by the river Po and E. by the Adriatic Sea. Area,



Ferrara. Façade of the cathedral of S. George, the lower part dating from 1135

1,019 sq. m. Low-lying and marshy in parts, it lies mostly within the delta formed by the Po and its branches and by the Primaro and the Panaro, and embraces the lagoons of Comacchio (*q.v.*). It was the scene of bitter fighting in April, 1945. Fairly fertile, it produces rice, grain, wine, hemp, silk, salt, and fish. The capital is Ferrara. Pop. 366,371.

**Ferrara.** City of Italy, capital of the prov. of Ferrara. It stands about 3 m. S. of the river Po di Volano, 30 m. by rly. N.N.E. of Bologna. An archiepiscopal see, its cathedral dates from the early 12th century. The city is

surrounded by crumbling walls, but its palaces and other structures attest its former splendour. Several churches and palaces were damaged during the Second Great War. Ferrara was the seat of the court of the family of Este (*q.v.*), and their castle (now utilised as public offices) was a moated fortress with four towers. The university was founded in 1264, and its library is rich in MSS. of Tasso, etc. Among other buildings are a picture gallery, and the houses of Ariosto and Guarini.

From the 14th to the 17th century Ferrara was a prosperous city, and in the 15th was noted for its school of painting. It has normally a trade in hemp, soap, wax, candles, glass, and silk. Guarini and Savonarola were natives. It came into the possession of the Este family in 1146, and was their capital until 1598, when it passed to the papacy. In the papal interest its fortress was garrisoned by the Austrians during the revolutionary times of 1832-59, after which the city joined the kingdom of Italy. In the Second Great War the British 8th army captured Ferrara from the Germans, April 24, 1945. Pop. 119,265.

**Ferrara, ANDREA.** Italian sword-maker of the 16th century. He was working in Belluno in 1585, and swords bearing his name were used in Scotland in the 16th and 17th centuries. The steel was tempered by a process claimed to be that invented by the swordsmiths of Damascus. The name Andrea Ferrara was afterwards employed rather as a trademark than as implying any connexion with the original maker.

**Ferrara-Florence, COUNCIL OF.** The oecumenical council of the Church held at Ferrara, and later at Florence, between April, 1438, and July, 1439. It was called by Pope Eugenius IV as a continuation of the council of Basel, and had as its main object the healing of the breach between the Roman and Greek churches. The Latin emperor, John Palaeologus, representing the Greeks, brought a large delegation at the pope's invitation to Ferrara. The scene of the council was changed to Florence in January, 1439. The debates turned chiefly on the Filioque controversy, *i.e.* the question whether the Holy Ghost proceeds from the Father and Son (*ex Patre Filioque*), or from the Father alone. On July 6 a decree was published which declared that, while the pope was the supreme head of all the Church,

the rights of the Eastern patriarchs were to be unaffected.

The two churches were thus momentarily united in intention, but not in effect. Isidore of Kiev was sent as legate to Constantinople by Pope Nicholas V in 1452, in order to push the process of union forward, but before he had accomplished his mission the city was taken by the Turks, 1453. This undid the work of the council, the last effort at Eastern and Western reunion.

**Ferreira, ANTONIO** (1528-69). Portuguese poet. Born in Lisbon, he was educated at Coimbra university. Famous as one of the earliest and the most distinguished of those who introduced the classical mode into Portuguese literature, he used the Italian decasyllable in his sonnets, substituting a measured austerity for the formless verse of his predecessors. His great work, the *Castro*, was the first verse tragedy written in Portuguese, and one of the earliest in modern European literature. He died Nov. 29, 1569.

**Ferrel, WILLIAM** (1817-91). American meteorologist. Born in Bedford co., Pa., he early turned his attention to meteorology, then a neglected science, and his researches soon won him world-wide fame. In 1867 he became a member of the U.S. coast and geodetic survey, and began to formulate the laws of meteorology on a scientific basis. His invention of a tide-predicting machine came into general use in the U.S. government coast surveys. He wrote *Tidal Researches*, 1874; *Meteorological Researches*, 1877-82; and *Popular Treatise on the Winds*, 2nd ed. 1898.

**Ferrel's Law.** Law of the deflection of bodies moving in the air of the rotating globe. If a body moves in any direction except E. or W. on the earth's surface the rotation of the earth will cause it to be deflected to the right of the direction of movement in the N. hemisphere, and to the left in the S. hemisphere. The law is an example of the general case in mechanics when a body acted upon by two forces moves in a direction compounded of the original directions of the forces. In the N. hemisphere a body forced northwards receives an eastward impulse from the earth's rotation, and moves towards the N.E.

**Ferrer, FRANCISCO** (1859-1909). Spanish revolutionary. Born near Barcelona, he was a railwayman,

1877-85, and studied socialism and rationalism. He was closely associated with the republican agitator Zorrilla, with whom he lived in Paris. Ferrer returned to Barcelona in 1901, and was prominent in founding lay schools and centres of advanced socialist and rationalist teaching. In 1907 he was acquitted of having taken part in the attempt to assassinate the king in 1906. In July, 1909, he was active in the insurrections in Barcelona, aiming at the establishment of a new anti-Catholic state in Catalonia. Condemned as the prime instigator, he was shot on Oct. 13, his execution raising much indignation, mainly against Roman Catholic influence in Spanish politics.

**Ferrero, GUGLIELMO** (1871-1942). An Italian historian and sociologist. Born at Portici, near Naples, July 21, 1871, he made his reputation as a historian with *L'Europa Giovane*, 1897. Professor of history at Rome, he moved to Geneva in 1930, and held the chair of modern history at the university there. A profound thinker, he was chiefly concerned in his later works with diagnosing the crisis in western civilization. His most important works included *History of the Roman Republic*, published 1902-09, and translated into almost every European language; *Tra i Due Mondi*, 1913; *Adventure*, 1936; *Reconstruction*, 1940; *Pouvoir: Les Génies Invisibles de la Cité*, 1942. He died Aug. 3, 1942.

**Ferrers, EARL.** British title borne since 1711 by the family of Shirley. The family of Ferrers first appeared in England with William the Conqueror. Henry Ferrers was a great landholder, especially in the North Midland counties, and his son Robert was made earl of Derby in 1138. His successors, who had Tutbury Castle for their main stronghold, were known as earls Ferrers or earls of Derby. John, son of the 6th earl, was summoned to parliament in 1299 as Baron Ferrers of Chastley. This title passed to the family of Devereux in 1461 and remained therein until 1646, when it fell into abeyance.

The Shirleys became connected with the title through the marriage of Sir Henry Shirley with the daughter of Robert Devereux, 2nd earl of Essex. In 1677 Sir Robert, a descendant of Sir Henry, was allowed to assume the baronial title, and in 1711 he was made Viscount Tamworth and Earl Ferrers. Laurence, the 4th



earl (1720–60), was the last peer in England to be executed as a felon. In 1745 he succeeded to the title on the death of his uncle. In a moment of anger he shot his steward, Johnson, and was tried for murder by his peers in Westminster Hall. Found guilty, he was hanged at Tyburn, May 5, 1760. Robert, the 12th earl, was born in 1894 and succeeded his father in 1937. Tamworth Castle, long the family seat, no longer belongs to the Shirleys.

**Ferrers, GEORGE** (c. 1500–79). English politician and poet. He was page of the chamber to Henry VIII, who took him with him in the Scottish and French wars and bequeathed him 100 marks. He is mainly remarkable for having produced and probably written masques for Edward VI's Christmas entertainments in 1551–52 and for having contributed several tragical episodes to Baldwin's *Mirror for Magistrates*, 1559–78.

**Ferret** (*Putorius*). Domesticated variety of the polecat, kept for hunting rabbits. According to Roman writers the polecat came from Africa, and although it is now quite unknown there, it is probable that it was originally domesticated in N. Africa or Spain, and afterwards introduced into Italy. As a result of domestication, the polecat became smaller and slimmer, and albinos became the rule instead of the exception. In this way the ferret developed. It is a somewhat delicate animal, and its intolerance of cold suggests its Mediterranean origin. It breeds readily with the wild polecat, and the brownish variety known as the polecat-ferret is probably the result of such crosses. The ferret is only semi-domesticated. It has no affection for its owner, is very ferocious, and is as likely to bite the hand that feeds it as any other. It therefore needs to be handled with caution, the best way being to grasp it close behind the shoulders.

The method of hunting a rabbit warren with ferrets is to net or stop all the holes except one, at which the ferret is inserted. The rabbits, finding an inveterate enemy on their track, bolt for the holes and are thus caught in the nets. It is a common practice to muzzle the ferret; otherwise, if it catches a rabbit in the burrow, it will remain there to make a meal of it.

Ferrets need great care to keep them in good health, warmth and scrupulous cleanliness being the chief essentials. Plenty of warm litter must be provided, and the hutch should be thoroughly cleaned and disinfected at least once a week. The food should consist of fresh bread and milk, and a little raw meat may be given once a week. Ferrets breed freely in captivity and usually rear two families in the year. See Rabbit.

**Ferrex and Porrex.** One of the titles under which the earliest extant English tragedy is known. See Gorboduc.

**Ferric Salts.** Iron forms, with acids, two series of salts, ferrous and ferric. The ferric salts are generally yellowish or reddish brown in colour, and are reduced to the ferrous state by means of zinc. Ferric chloride ( $\text{FeCl}_3$ ) is prepared in the anhydrous state by heating iron wire in a current of dry chlorine gas, and in the form of solution by dissolving iron wire in hydrochloric acid and then passing chlorine into the liquid until it smells of the gas.

As a tincture ("steel drops") ferric chloride is used in medicine as a tonic. With a soluble thio-cyanate, ferric chloride gives an intense blood-red colour. Ferric sulphate,  $\text{Fe}_2(\text{SO}_4)_3$ , ob-

tained by oxidising ferrous sulphate by means of nitric acid, is used in combination with logwood to dye cotton black. Iron alum is a compound of ferric sulphate and potassium sulphate. This and ferric nitrate are used in dyeing. Ferric oxide, which occurs naturally and is also produced by distilling ferrous sulphate, is known as red ochre and colcothar, and used as colouring matter and polishing material.

**Ferricyanides.** Salts of ferricyanhydric acid,  $\text{H}_3\text{Fe}(\text{CN})_6$ , first made by Gmelin by decomposing lead ferricyanide with dilute sulphuric acid and evaporating the solution after filtration. Potassium ferricyanide or red prussiate of potash is prepared by passing chlorine through a solution of potassium ferrocyanide or over the dry salt until it no longer gives a blue colour with a ferric salt.

The salt is in deep red crystals and forms with water a dark yellow solution which darkens with age and becomes converted into ferrocyanide. On adding ferrous sul-

phate (green vitriol) to potassium ferricyanide solution a blue precipitate known as Turnbull's blue is obtained. When chlorine is passed into a solution of potassium ferricyanide a green precipitate known as Prussian green is formed, the appearance of which is the indication that the end of the process has been reached. Potassium ferricyanide, a powerful oxidising agent, when employed with caustic potash, is used in the preparation of ferro-prussiate paper upon which "blue prints" are made. See Colour Printing.

**Ferrier, JAMES FREDERICK** (1808–64). Scottish metaphysician. Born at Edinburgh, June 16, 1808, he was professor of moral philosophy and political economy at St. Andrews from 1845 until his death, June 11, 1864. Like Berkeley, he is an idealist and immaterialist. There is no such thing, he believes, as independent matter; all external things exist only subjectively; the only material world which really exists is one with which intelligence co-exists. The conscious subject is inseparably connected with the conceived object. At the same time, he does not deny the existence of the real material world *per se*, as distinct from that known to us through the subjective medium of space and time, but declares it to be simply unknowable. His most important work is *Institutes of Metaphysics*, 1854.

**Ferrier, PAUL** (1843–1920). French dramatist. Born at Montpellier, he studied for the bar, but turned to playwriting after the production of his first piece, a verse play, *La Revanche d'Iris*, in 1868. He wrote and collaborated in a large number of opera libretti, comic operas, and comedies, well known in France for their gaiety and humour. Among the most successful were *Les Mousquetaires au Couvent*, 1880; *Tabarin*, 1884; *L'Article 231*, 1891; *La Belle Mère*, 1898. He died Sept. 11, 1920. *Prom. Ferry-ay.*

**Ferrier, SUSAN EDMONSTONE** (1782–1854). Scottish novelist. Born at Edinburgh, Sept. 7, 1782, she published her first novel, *Marriage*, in 1818, followed by *The Inheritance*, 1824, and *Destiny*, 1831. Published anonymously they gave a shrewdly satirical



Ferret. The domesticated polecat which is used for rabbiting



picture of contemporary Scottish society, and won great popularity and the praise of critics as eminent as James Hogg and Scott. She was known familiarly as Scott's "sister-shadow," and died at Edinburgh, Nov. 5, 1854. Her *Recollections of Visits to Ashestiel and Abbotsford* were published in 1881.

**Ferrite.** In metallurgy, the form of iron which is stable at temperatures below 900° C. Above this temperature iron containing only small amounts of carbon is in the form of a solid solution of carbon in gamma-iron. This is called austenite and has a face-centred cubic crystal lattice. At 900° C. it transforms to alpha-iron or ferrite, which has a body-centred cubic lattice and will hardly dissolve any carbon at all. The excess carbon dissolves in the remaining gamma-iron and a typical eutectoid (*q.v.*) is formed, known as pearlite. Ferrite is feebly magnetic above 780° C., but below this point strongly so. By itself ferrite is not very strong and steels owe their hardness and strength largely to the carbide, cementite.

**Ferro-Alloys.** Series of alloys of iron with high proportions of manganese, chromium, vanadium, silicon, molybdenum, tungsten, or similar element. They are widely used in steel making, being the most convenient form in which to add the various alloys used for deoxidising and alloying. With between 10 and 90 p.c. of the alloying element, they have a hard brittle character. Ferro-manganese is still made in the blast furnace much as pig iron is. Ferro-silicon and ferro-chrome are made more cheaply and with lower carbon content in the electric arc furnace. For ferro-silicon the furnace is fully charged with iron ore or scrap iron and quartzite and melted gradually away from the electrodes by the great local heat generated by the arc. The use of the electric furnace has contributed to the development of alloy steels.

**Ferro-Concrete.** Material used in building. It is described under Concrete. *See also* Building.

**Ferrocyanides.** Salts of ferrocyanic acid,  $H_4Fe(CN)_6$ . Most ferrocyanides are coloured, and those of the soluble alkalis are non-poisonous, although from them hydrocyanic or prussic acid can be readily prepared. The most important of these salts is potassium ferrocyanide or yellow prussiate of potash. The old process of manufacture consisted in fusing together potassium carbonate with iron borings and

nitrogenous animal matter such as leather cuttings or woollen rags, and lixiviating the mass with water. Potassium ferrocyanide is a by-product of the manufacture of coal-gas. It is used in producing Prussian blue (ferric ferrocyanide) and other cyanogen compounds in calico-printing, and for case-hardening iron.

**Ferrol.** Seaport of Spain, in the prov. of Corunna. It stands on the N. arm of the Bay of Betanzos, and is the chief Spanish naval station on the Atlantic. The harbour is sheltered and commodious, with shipbuilding yards, docks, and quays, defended by both nature and art. It has a first-class arsenal, a naval academy, and many fine public buildings. It manufactures naval stores, leather, sailcloth, cotton and linen, and exports pit-props, vinegar, brandy, and sardines. The British besieged it in 1799, and took it in 1805, after defeating the French fleet off the bay. It was captured by the French after six weeks' blockade in 1823. Pop. 63,714.

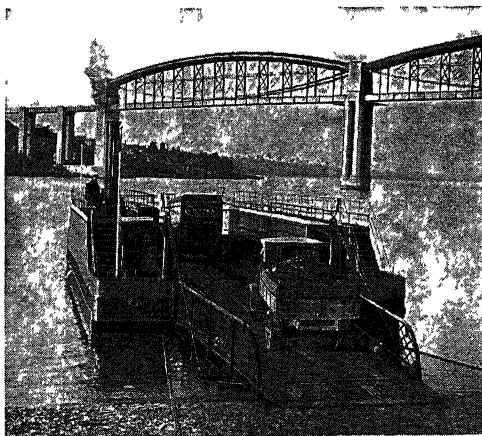
**Ferrous Salts.** Group of iron salts. Ferrous sulphate,  $FeSO_4 \cdot 7H_2O$ , green vitriol, or copperas, is obtained in large quantities by exposing the pyrites occurring in coal-measures to the atmosphere. The soluble ferrous sulphate together with the excess of sulphuric acid, runs into underground tanks where the excess of acid is removed by means of scrap iron. The liquid, on evaporation, yields crystals of ferrous sulphate.

Ferrous sulphate is used in the manufacture of ink, in dyeing and tanning, and in the preparation of Prussian blue. The pure salt is used in medicine. Ferrous oxide,  $FeO$ , has the property, when freshly made, of oxidising with incandescence on exposure to the air. Ferrous iodide,  $FeI_2$ , is used in medicine, as are also ferrous phosphate,  $Fe_3(PO_4)_2 \cdot 8H_2O$ , and ferrous carbonate,  $FeCO_3$ . The last-named is contained in chalybeate waters, from which the ferrous carbonate is deposited, on exposure to air as the hydrated oxide.

**Ferrule.** A short metal tube driven tightly into a hole in an iron or steel pipe and soldered or otherwise secured to another pipe so as to connect the two. It is also a short tapered tube driven into the end of a boiler-tube where it passes through the fire-box plate. The wedging action of the ferrule expands the boiler-tube end and ensures a tight connexion between the boiler-tube and the plate. There are also other types of boiler-tube ferrules. In common speech the word is used of a metal ring on the handle of a tool, and of the thimble-shaped covering at the end of a walking-stick or umbrella to protect it against wear.

**Ferry.** A public passage-way across water, usually linking up roadways or tracks on both banks. The most usual means of transport is a floating vessel of some kind which, for small loads and short distances, is frequently a flat-bottomed boat, guided by a taut wire cable and propelled by an endless rope. For heavy loads the ferry-boat may be moved to and fro by a windlass on board, which picks up and pays out a chain crossing the bed of the river. Where there is a strong current in one direction only, the ferry-boat may be attached to a chain the other end of which is moored in midstream some distance higher up, the current being used to move the boat across by oblique pressure. *See* Congo illus.; Train Ferry.

In the Second Great War, the term was also applied to the delivery of aircraft to the depots and first-line units. Ferry Command (*q.v.*) of the R.A.F. was formed for trans-Atlantic operations, and, within Great Britain, Air Trans-



Ferry. The chain ferry which crosses the Tamar from Cornwall to S. Budeaux, nr. Plymouth, Devon

port Auxiliary (*q.v.*) carried out a similar function.

**Ferry, JULES FRANÇOIS CAMILLE** (1832-93). A French statesman. Born at St. Dié in the Vosges, April



Jules Ferry,  
French statesman

15, 1832, he became a lawyer and a journalist. In 1869 he was chosen as deputy for Paris, being already known as a vigorous opponent of the emperor. When Paris was besieged, as prefect of the Seine he was responsible for its government. After being minister at Athens, he returned to the chamber of deputies in 1873 and entered the ministry in 1879. In 1880 he became premier for a short term, and was again premier, 1883-85, being in the meantime minister for education. In 1885 he retired, but was active in politics until his murder by a lunatic, March 17, 1893, just after he had been chosen president of the senate. Ferry did much to promote secular education, and to establish French influence in Africa and Indo-China.

**Ferrybridge.** Town of the West Riding of Yorkshire, England. It stands on the Aire, 2 m. N.E. of Pontefract, and has a railway station. In 1461 it was the scene of an engagement during the Wars of the Roses. Here is a large electric power station, close to the Great North Road.

**Ferry Command.** Organization founded by 85 (transport) group of the R.A.F. for ferrying American-built aircraft to Great Britain during the Second Great War. Early in the war the ferrying of military aircraft across the Atlantic was the responsibility of the ministry of Aircraft Production, but in July, 1941, the work was transferred to the newly-formed Ferry Command. A large proportion of the pilots of Ferry Command were recruited from Imperial Airways, and the whole organization was under the command of Air Chief Marshal Sir Frederick Bowhill. In May, 1943, Ferry Command was absorbed by the R.A.F. Transport Command. See Atlantic Ferry.

**Fersen, FREDRIK AXEL, COUNT VON** (1719-94). Swedish soldier and politician. Of Scottish descent, Fersen was born at Stockholm, and as a young man served with the French army with distinction. In 1748, he fought against Prussia in the Seven Years' War. Marshal of

the Swedish diet in 1755, and again in 1769, Fersen was prominent as leader of the aristocratic party (the "Hats"). From 1786 he was an open and powerful opponent of Gustavus III, and was put under arrest for a time in 1789, after which he retired.

**Fersen, HANS AXEL, COUNT VON** (1755-1810). Swedish soldier. Born at Stockholm, Sept. 4, 1755, he served in the Swedish army. Afterwards he resided at the court of Louis XVI of France, with whom he became a great favourite. During the American War of Independence he fought under Lafayette. When the king and Marie Antoinette, to whom Fersen was devoted, fled to Varennes in 1791, Fersen was the driver of the coach. After his return to Sweden he was murdered by a mob, June 20, 1810, on suspicion of having been concerned in the death of the Crown Prince. His innocence was later proved.



Hans von Fersen,  
Swedish soldier

**Fertilisation.** Biological term for the union of two dissimilar cells which precedes the production of a new individual by sexual means. Many plants and animals produce two kinds of monoploid reproductive cells or gametes, a smaller and often motile male, and a larger usually non-motile female. Neither can normally continue existence independently, and union of such cells periodically is usually essential for the maintenance of the race. Occasionally new individuals may arise from female structures which have not been fertilised: this constitutes parthenogenesis.

In some species both male and female reproductive organs are present in the same individual. When dissimilar gametes formed by one organism unite, the process is termed self-fertilisation. In higher animals cross-fertilisation is the rule, and in this process the sperm and the ovum which unite come from two distinct members of opposite sex. Fertilisation is facilitated by the movement of the male gamete. Typical sperms of animals consist of a mainly nuclear head and a propelling tail, which correspond with the body and cilia of the antherozooids of those plants whose male gametes swim to the female to effect zoidiogamous (*Gr. zoidios, of animals*) fertilisation. The male gametes of

other plants have no obvious means of propulsion, but some reach the oosphere by means of fertilisation tubes; the process is then siphonogamous fertilisation.

The female gamete is undoubtedly co-active in bringing about fertilisation: in many, probably all, instances it exudes soluble material to guide the male cell in chemotaxis (*q.v.*); the oospheres (*q.v.*) of a number of lower plants provide a special receptive region through which the male cell enters, and a number of animal ova appear to engulf the male cell when the latter has made contact and active movement has ceased. Female gametes generally also inhibit the entry of more than one male cell by forming membranes around themselves after the first has penetrated. The nuclear portion of the male gamete sometimes, though not indisputably always, accompanied by cytoplasmic structures sinks into the female cell where ultimately all trace of any male cytoplasm is lost and the male nucleus coalesces with the female nucleus. Fertilisation is then complete, and the single diploid cell so formed is a zygote, the first cell of a new organism.

The process of fertilisation has a twofold effect: it initiates the physiological activity which results in development of the zygote; it is complementary to meiosis in the reorganization of nuclear material with the accompanying reassortment of Mendelian characters. Uncertainty of the fate of parts of male gametes other than the nucleus leaves doubt as to whether male parents transmit any characters other than those borne by the nucleus. Since, however, the female gamete habitually has a considerable bulk of material outside its nucleus and this becomes part of the zygote, there is a considerable possibility that female parents may pass on to their offspring characters additional to those carried by the chromosomes. See Cytology; Embryology.

**Fertiliser.** Substance applied to the soil to furnish plant foods. The term manure is used for organic substances which confer benefits on the soil in addition to providing a plant food. In general, fertilisers contribute one of the essential plant foods, nitrogen, phosphates, or potash, but a few give two or three together. They are described according to the essential plant food they supply, and in relation to the rate at which the particular substance is made available to the plant. Thus,

there are nitrogenous, phosphatic, and potassic fertilisers of quick and of slow acting propensities.

Nitrogen influences the development of stem, leaves, and root and thus the size of the plant; phosphate has an effect on the root; potash is concerned with carbon assimilation and hence with fruit and seed formation. In the absence of potash plants are more liable to fungoid diseases. The optimum effect of any one fertilising constituent cannot be obtained except in the presence of an abundant supply of the other two; hence, unless there is sufficiency of the others, the use of one alone is not recommended.

Of the nitrogenous fertilisers, sulphate of ammonia, nitrate of soda, nitrate of lime, and calcium cyanamide represent the quickly acting form, all possessing a high percentage of nitrogen; calcium cyanamide also has a high percentage of lime. Bones long formed the basis of supplies of phosphate, but now the supply is augmented by quantities of rock phosphate. Raw bones contain about 10 p.c. of fat; when this is removed the resulting product ground is a valuable fertiliser.

#### Composition of Superphosphate

Superphosphate is water-soluble and obtained by treating bones and rock phosphate with sulphuric acid. Basic slag, a by-product in the manufacture of steel, is another source of phosphate; the latter is insoluble in water but soluble in dilute acids such as exist in most soils. Basic slag also contains lime.

Potash comes from the ash of plants after incineration, the largest supplies from the Stassfurt deposits in Germany, from Alsace, and from Palestine. Potash from these sources exists as chlorides and sulphates in combination with chlorides and sulphates of magnesium and sodium. The amount ranges from about 48 p.c. in sulphate of potash to 12 p.c. in kainit. In Great Britain potash is applied to potatoes, sugar beet, mangolds, and market garden crops, and, on light land, to clovers, permanent grass, and, as far as possible, cereals.

Farmyard manure is by far the most general and valuable of all organic manures; its chemical composition is variable, but an average figure of fertilising constituents is nitrogen 10-15 lb., phosphoric acid 4-9 lb., potash 9-18 lb. Apart from its actual fertilising influence, farmyard manure has a most salutary effect on the physical condition of a soil

by increasing its workability and moisture-retaining capacity, in addition to contributing essential bacteria.

**Ferule** (Lat., *ferula*, fennel, cane, *ferire*, to strike). Instrument of punishment. The stalk of the giant fennel, *Ferula communis*, was used as a rod or cane, to which it gave its name. The word is applied also to a sole-shaped strap, comparable to the Scottish tawse, with which boys are beaten on the palms of the hands in some schools.

**Fescennine Verses.** Improvisations in dialogue form made at rustic gatherings in ancient Italy, the origin probably of the native Roman *satura*, or satire, in which the speakers made capital out of the faults and follies of their neighbours. As a feature of wedding celebrations they were commonly characterised by broad licentiousness. Hence the derivation of the name from the Lat. *fascinum*, a phallic emblem, by some etymologists who deprecate its other derivation from Fescennia on the ground that the custom was widespread throughout Italy, and not peculiar to that small Etruscan town. From the Fescennine verses the epithalamium, or nuptial song, was ultimately developed, a literary form of which Catullus, for one, made exquisite use, and which has been successfully reproduced in the literature of many countries, notably by Herrick in England.

**Fesch**, JOSEPH (1763-1839). French cardinal. Born at Ajaccio, Jan. 3, 1763, the step-brother of Letizia Bonaparte, he was archdeacon of Ajaccio until the French revolution, when he retired. He had always befriended the Bonaparte family, and in 1802 Napoleon made him archbishop of Lyons, and procured for him a cardinal's hat. Ambassador at Rome in 1804, he persuaded Pius VII to crown Napoleon in Paris, and was made grand almoner and senator of the Empire. His position as intermediary between Napoleon and Pius was extremely difficult during 1806-07, and Fesch's relations with both became strained, especially after the Gallican council of 1811, from the presidency of which the emperor dismissed his uncle. Retiring to Rome on the fall of the Empire in 1814, he died there May 13, 1839.

**Fescolising.** Method of improving the resistance to corrosion or wear of a steel article by depositing electrolytically another metal on the surface. Nickel and chromium are commonly used; they may be deposited only on

the parts submitted to most wear by protecting the other parts from the electrolyte with a layer of grease, etc. See Electrolysis.

#### Fescue Grass

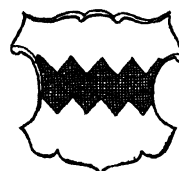
(*Festuca*). Extensive genus of grass. Of the family Gramineae, they are natives of cold and temperate regions. The flattened flower spikelets are grouped in panicles or racemes; there being three or more flowers in each spikelet. Many species are among the most valuable of meadow and pasture grasses, being rich in saccharine matter. Sheep's fescue (*F. ovina*), with bristle-like leaves, which grows in hilly pastures that are dry and open; meadow fescue (*F. pratensis*), and hard fescue (*F. duriuscula*) are most useful for this purpose.



Meadow Fescue, *Festuca pratensis*

and occupying one-third of the field. It is one of the ordinaries (q.v.). The middle of the field is known as the fess point. A shield or charge divided by a horizontal line in the middle is said to be "per fess"; but if it is divided into any number of horizontal bands above four, it is called "barry." If there are three divisions it is "tierced" or "tiercy per fess"; if four, "quartered per fess." Charges placed in horizontal rows are termed "in fess."

**Fess** (Lat. *fascia*, band). In heraldry, a horizontal band carried across the middle of the shield



Fess, in heraldry

and occupying one-third of the field. It is one of the ordinaries (q.v.). The middle of the field is known as the fess point. A shield or charge divided by a horizontal line in the middle is said to be "per fess"; but if it is divided into any number of horizontal bands above four, it is called "barry." If there are three divisions it is "tierced" or "tiercy per fess"; if four, "quartered per fess." Charges placed in horizontal rows are termed "in fess."

**Festiniog** or **FESTINIOG**. Urban district and town of Merionethshire, Wales. It is 16 m. N. of Dolgelly, and stands amid the hills, surrounded by beautiful scenery, one feature of which is the Cynfael Falls. The town, not to be confused with Blaenau Festiniog, is

served by railway. The main industry is the large slate quarries, which employ most of the male inhabitants. Pop. 9,072.

**Festival** (Lat. *festivus*, joyful). Days on which some deity or person was honoured or the memory of some important event kept with certain solemnities, ordinary work being as a rule suspended. Such festivals or feasts no doubt were originally nature festivals, connected with its changing phenomena, its decay in winter and renaissance in spring (see Adonis). They were partly merrymakings and thanksgivings for benefits received, partly prayers for benefits to come, and partly ceremonies to appease the anger of the gods for sins committed, though even from the latter the festive element was not absent.

The Greek festivals were held in honour of national heroes; of gods connected with the fruits of the field, such as the Dionysia, Lenaea, and Eleusinia; and of the tutelary deities of Athens, such as the Panathenaea. The four great games—Isthmian, Nemean, Olympian, and Pythian—set the seal on the national unity. At Rome each family kept the festival of its domestic gods, the Lares and Penates; the public festivals were under the control of the state—festivals in honour of the tutelary deities of Rome, Romulus, Mars, and Quirinus, and of the divinities who presided over the crops, the fields, and boundaries, such as the Cerealia, Lupercalia, Saturnalia, and Terminalia. The public games (*ludi*) were also national festivals. (See *Feriae*; *Ludi*.)

#### Religious Festivals

Religious festivals are days set apart for rest, thanksgiving, and special observance. Some are fixed, as Christmas; others movable, as Easter. In the Christian calendar the greater festivals are called red letter days; while the lesser are known as black letter days.

Among the Jews such days are regarded as days appointed by God for meetings with His children. They include Passover, or Unleavened Bread, Nisan 15–22; Pentecost, Sivan 6; Trumpets, or New Year, Tishri 1; the Day of Atonement, or Great Sabbath, observed on Tishri 10, by complete rest and fasting, the only fast not postponed by the occurrence of the Sabbath; the Tabernacles, or Ingathering of the Harvest, Tishri 15–22; Jubilee, at the end of every seven Sabbatical Years; Purim, etc.

In the Christian Church the earliest festivals were the love feasts or Agapae (*q.v.*). Confusion has been caused by disregard of

the fact that both authorship and date of festival homilies are uncertain. Until the beginning of the 4th century, record exists only of Easter and Pentecost, though as each Friday was a fast in remembrance of the Crucifixion, so each Sunday was a festival in remembrance of the Resurrection. The feast of the Nativity was observed about 300; Christmas, Epiphany, and Ascension Day were added later.

#### Saints and Martyrs

Days in memory of the Apostles were next observed, and were followed by observance of days devoted to the memory of saints, of the Purification of the Virgin Mary, the Annunciation, the nativity of S. John the Baptist, the Circumcision, the death of martyrs, the transfer of their relics or the consecration of churches dedicated to them. Many Christian festivals are of local origin, some adapted from Jewish and pagan practice, and they increased in number during the Middle Ages. In the Roman Catholic communion, feasts are divided into doubles, semi-doubles, simples, etc., according to the offices appointed for them.

Inclusive of Sundays, festivals in the Anglican calendar number 149; of these the principal have proper collects, epistles, Gospels, and lessons, and some have a proper preface at Holy Communion and proper Psalms. The movable festivals which depend upon Easter are Septuagesima, Rogation Sunday, Ascension Day, Whit Sunday, and Trinity Sunday. In Great Britain public observance of Church festivals, apart from Easter, Whitsun, and Christmas, has fallen into abeyance; formerly all were made the occasion of some difference in the ordinary daily life of the people

#### Bairam and Ramadan

The chief festivals among Mahomedans, whose rest day is Friday, the day on which Mahomet was born, are the Feast of Bairam, that of Sacrifices, and that following the fast of Ramadan. The Hindus have their festivals, as that of Siva; and among certain tribes of North America is observed a festival called the Day of the Dead. The French Revolutionary calendar included five festival days, dedicated respectively to Virtue, Genius, Labour, Opinion, and Rewards, all in September. See Calendar; Prayer Book; articles under the name of each festival or saint; consult also Church Festivals, A. J. Maclean, in the Prayer Book Dictionary, 1912.

**Festival of Britain.** See N.V.

**Festubert.** Village of France in the dept. of Pas-de-Calais. It is 3 m. W. by N. of La Bassée and was prominent in the First Great War. There was an engagement here between the British and the Germans, Nov. 23–24, 1914. On the night of Nov. 23. the Germans had carried up a sap close to the Allied trenches, E. of Festubert, which were held by troops of the Indian corps. When day broke next morning the German infantry poured a storm of bombs



Festubert. Plan of the country over which were fought the battles of Nov., 1914, and May, 1915

and hand-grenades into the most advanced British trenches. They followed up this bombardment with an attack, and penetrated into the British trenches.

In the afternoon Sir J. Willcocks, commanding the Indian corps, ordered the original line to be recovered and held at all cost. All available British guns were directed to shell the trenches that the Germans had captured, as preparation for a British counter-attack, which was to open at 4.30. The infantry had to advance over snow-covered ground and they were received with violent machine-gun fire. But after hard and continuous hand-to-hand fighting, the ground lost was recovered.

**Festubert, BATTLE OF.** Fought during the First Great War, May, 1915. To assist the French operations in Artois and at Arras, where Foch was attacking, the British

First Army (Haig) was ordered to take the offensive on a front N.W. of La Bassée, from Laventie to Richebourg l'Avoué, against the German works on the Aubers Ridge. On the N. portion of this front the 4th corps (Rawlinson) attacked; on the S., the Indian corps (Willcocks) and the 1st corps. On May 9 the infantry advanced after a 40-min. bombardment, but found that the Germans were perfectly prepared, and that their wire had not been cut or their defences demolished by the artillery. The attack failed with heavy British losses. The total of killed, wounded, and missing exceeded 12,000, without any result, except that the Germans were held down in the section of attack. The failure was due to the weakness of the British artillery.

Nevertheless, French decided to resume the attack, extending it S. to Festubert. On May 15 the British once more assaulted, late in the night, after a prolonged artillery preparation. The troops engaged were the Indian corps on the British left, with the 2nd division at Givenchy and the 7th at Festubert. The Canadian division was placed in support. The 2nd division broke into the German trench system, carrying it for about half a mile, and the 7th division, attacking E. of Festubert, took another section of the German line, but between these two indentations the Germans could not be dislodged. They counter-attacked in the night of May 16, and forced back the 2nd division slightly, though most of the ground won was held. On May 17 the British, both from N. and S., assaulted the German wedge, 1,000 yds. long, between the two dents, and cleared it.

The trench battle continued on the following days; the British were much hampered by wet weather and insufficient ammunition, but ground was slowly gained, always at the price of heavy sacrifices. On May 20-21 the Canadians took up the work of the 7th division before Festubert; on May 25 the 47th London Territorial division was put in on the British right at Givenchy, and captured a section of the German line there, which was successfully held. The battle brought little result, as the capture of some thousands of yards of trenches was no compensation for the heavy sacrifices incurred. In killed, the British loss was 3,620, wounded, 17,484; missing, 4,321.

H. W. Wilson

**Festus.** Poem by Philip James Bailey (*q.v.*). First published in 1839, it was added to and otherwise altered during 50 years until in its

final form, 1889, it consists of about 10,000 lines. A variant of the Faust legend, illustrating the ultimate triumph of good over evil, its scenes take place in Heaven and on the earth, and though it introduces "the three Persons of the Trinity as interlocutors in its wild plot" in a way which many readers resented, it has frequent terse and happy lines which have become familiar quotations.

**Festus, Porcius** (d. A.D. 62). Procurator of Judaea in succession to Felix, about A.D. 58. He heard, in the presence of Herod Agrippa II and Berenice, the case of S. Paul, whom he sent to Rome for trial (Acts 24-25; Josephus's *Ant. of the Jews*, xx, 8; Wars, ii, 14). He is said temporarily to have suppressed the Sicarii or Assassins, and was, if cynical, inclined to justice. He is introduced in a powerful short story, *The Procurator of Judaea*, by Anatole France

**Festus, Sextus Pompeius** (3rd century A.D.). Latin grammarian. He was the author of an abstract of the important work by Marcus Verrius Flaccus, *On the Meaning of Words*, containing an alphabetical list of obsolete words, together with valuable information concerning old state institutions and ceremonial. Part of it (M-T) has been preserved in the abstract of Festus and a further epitome by Paulus Diaconus (8th century), which is complete.

**Feth Ali Shah** OR **BABA KHAN** (1762-1834). Shah of Persia. Nephew of Aga Mohammed, he came to the throne in 1798, and threw himself into a contest with Russia to recover Persia's lost Caucasian territories. This brought him into conflict with Britain in 1812, and by the treaty of Gulistan, 1813, Feth Ali was forced to cede Georgia and seven adjacent provinces to Russia. War with Turkey



Fetichism. 1. Bondu witches or devils from Sierra Leone. 2. Man of Angola worshipping two fetishes. 3. Natives of the Sierra Leone hinterland with their fetish. See next page.



followed, 1821–23, but neither side gained material advantage. He died at Ispahan, Oct. 20, 1834.

**Fetishism** (Lat. *factitius*, artificial). Belief that the services of a spirit may be appropriated by the possession of its material embodiment. The 15th century Portuguese navigators applied to the sacred objects of the West African negroes the term *feitiço*, which they used of their own amulets. There is, however, a radical distinction between a fetish, which is a subservient spirit in its shrine, and an amulet, which—as in a modern mascot—is merely an instrument of spirit service. So also a fetish is not a god or even a divine image, and fetishism is not idolatry. The term as defined above conveniently describes a phase of the magico-religious life of negro Africa, and an analogous though not identical one of that of aboriginal America.

The fetish spirit may be bodiless or a disembodied soul; it may reside in a shell or a tooth, a hoof or a horn, a bead or a rag. The choice of an object as a fetish is often determined by its unusualness; the Mendi people consecrate to the same use rough soapstone statuettes (British Museum) found in caves abandoned by an earlier race. In the heart of Africa there is a tendency to turn a shapeless stone or a post—by a dab of paint or by crude chiselling—into human semblance. But the fetish is treated as a genie or guardian spirit, rather than as a superior. It is consulted or implored, praised or reproached, treasured or discarded. Its special “medicine” is discovered by experiment; the strings of *wongs* hung about the neck, over the hut door, at the village entry, have their several potencies, giving health, success, children or rain. (See illus. p. 3313.)

Among the American Indians, spirit-possessed objects are employed in an analogous way. With the Zuni, objects bearing or made to bear an animal semblance are highly prized, especially when consecrated by long tribal tradition. Here, however, a totemic aspect is observable; some objects once classed as fetishes are now perceived to be totems. The Amerind fetish usually differs from the African in possessing an impersonal power which the Iroquois call *orenda* and the Algonquins *manito*. (See Totemism.)

In psychology, the word fetishism is used to describe an abnormal condition in which the sufferer is obsessed by the attach-

ment of sexual significance to everyday objects having no direct sexual association.

**Fetter Lane**. London thoroughfare linking Fleet Street with Holborn. First mentioned in 1612 and once a way leading to gardens, its name is variously derived from *faitours*, vagabonds; and *feutriers*, felt-makers. The town hostel of the bishops of Norwich was once here. On the W. side is an entrance to Clifford's Inn (*q.v.*), with the Record Office and Breams Buildings, containing Birkbeck College, beyond. In Fleur-de-Lis Court, the scene of Mrs. Brownrigg's murder of her apprentice, Mary Clifford, in 1767, is Newton Hall. Buildings in the middle part of Fetter Lane were destroyed in air raids in the Second Great War.

**Fettes College**. Scottish public school. Founded with money left by Sir William Fettes (1750–1836),



Fettes College arms

lord provost of Edinburgh, it was opened in 1870, on a site near Inverleith Park, Edinburgh. It is now governed under a scheme dating from 1886. It possesses a fine range of buildings and laboratories, gymnasium, playing fields, etc. Four boarding houses and a school house accommodate 350 boys.

**Feu**. In Scotland, land held of a feudal superior on terms involving the payment of a perpetual rent called a feu duty. Land is usually feued for building purposes, the vassal (buyer) undertaking to build. A feu thus resembles a building lease in England.

**Feuchtwanger**, LION (b. 1884). German writer, born in Munich, July 7, 1884. His first novel was *Jew Suss*, published in 1925 and trans. into English by Willa and Edwin Muir in 1926. It achieved remarkable success, and was made into a play and a film. The Ugly Duchess appeared in 1926, trans. 1927. Being a Jew, Feuchtwanger was compelled to leave Germany after the Nazis' advent to power in 1933, and lived in France, but in 1940 was placed in a concentration camp. He escaped to the U.S.A. His later works included *Exile*, 1939; *Paris Gazette*, 1940; *The Day Will Come*, 1942.

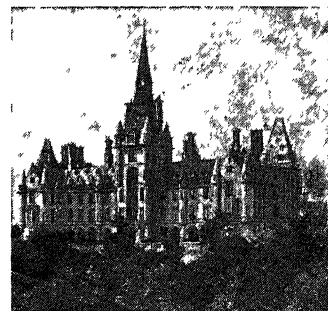
**Feud**. Word meaning a state of animosity, generally between two parties. It carries the idea of continuous hostility. A notable instance is the feud between the Guelphs and Ghibellines, and there

are instances among the Scottish clans, e.g. between the Campbells and the Macdonalds. See *Vendetta*.

**Feudalism** (late Lat. *feudum*, A.S. *feoh*, cattle, property). Name given to the social and political structure or organization which grew up on the ruins of the Imperial Roman system in Western Europe during the early Middle Ages. Universally established in its main features by the end of the 11th century, on its political side it was by the 16th century yielding to the effective concentration of the sovereign authority in the hands of supreme central governments.

It was based upon tenure of land. According to the lawyers, every foot of soil was actually the property of the king. Estates had been granted by him to his servants upon recognized conditions. On those conditions the king's “men,” “barons,” “tenants-in-chief,” “vassals,” held their lands from their overlord the king. They in their turn had granted portions of their estates upon like conditions to their own men or vassals. The actual occupants of the soil also held their plots of land upon conditions, from their overlord. Except the king, every holder of land was someone's vassal.

The primary condition of holding land was the rendering of military service to the immediate overlord; at the bottom of the



Fettes College, Edinburgh, from the south  
J. C. Inglis

scale agricultural or other kinds of service took the place of military service. The vassal rendered homage to his overlord, taking the oath of allegiance and service to him as his man, the lord taking corresponding oath to be “true lord and protector” to his man, the whole system being based upon the recognition of mutual obligations. Since the small landholder was not strong enough to protect himself against a powerful neighbour, and could hardly appeal to a distant overlord for protection it was customary for the small men to “commend” themselves to the

powerful—that is, to surrender their land (since it was alienable) to a lord, from whom they received it back as his tenants or vassals. Custom established the right of hereditary succession in various forms, and the claims a lord was entitled to make upon his tenants.

Broadly speaking, on the continent of Europe, it was generally held that the vassal owed allegiance only to his immediate lord, the result being that the king's great vassals, dukes or counts, could, if they chose to resist him, call upon their own vassals to serve against the king; the royal power depended in effect on the loyalty of the great vassals who individually, or by combination, were strong enough to defy him. Thus when a duke of Aquitaine, a vassal of the French crown in respect of Aquitaine, happened also to be king of England in respect of which he was independent of the French crown, he was able singly to defy his overlord; so also when one person was at once duke of Aquitaine, duke of Normandy, and count of Anjou.

In England the feudal system was not accompanied by an equal danger, because until the 15th century no single feudatories held sufficiently extensive domains to be strong enough to defy the crown except by means of widespread combination. Also, in England, the doctrine prevailed from the first that allegiance to the overlord prevailed over allegiance to the immediate lord. The last remaining relics of feudalism were abolished by the Law of Property Act, 1925. *See* Manor; Villeinage; *consult also* Constitutional History of England, W. Stubbs, 1897.

**Feu de Joie** (Fr., joy-fire). Running fire of musketry used generally on occasions of rejoicing. Ranks of soldiers fire one after another, beginning on the right of the front rank and continuing from the left of the second rank, etc.

**Feuerbach, Ludwig** (1804-72). German philosopher. Born at Landshut, Bavaria, July 28, 1804, he attended Hegel's lectures at Berlin, and became a tutor at Erlangen. He abandoned teaching for a literary career in consequence of the excitement caused by his *Thoughts on Death and Immortality* (published anonymously 1830), in which he denied the im-

mortality of man. Subsequently inclining towards atheism, he declared the reconciliation of faith and science to be impossible, and in the place of theology substituted anthropology. The body is the very essence of man; the idea of a superhuman power is a fiction of man's own imagination. Man is only what he eats. Sensuous enjoyment is the supreme good, but only attainable by man as a member of society. He died near Nuremberg, Sept. 13, 1872. His other works include *The Essence of Christianity*, 1841, Eng. trans. M. Evans, 1854; and *The Philosophy of the Future*, 1843.

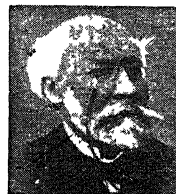
**Feuillants.** Religious order that flourished in France from the 16th century. It was an offshoot of the Cistercians, and the name originated in their monastery at Feuillant, near Toulouse. The abbot there, Jean de la Barrière, got into trouble with the authorities, so with a following he migrated to Paris in 1587, and founded the new order, one adopting a stricter form of life. A home was given to them in Paris by Henry III, and in 1589 they were recognized formally by the Pope. A later pope divided the order into two branches, French and Italian. The French kept the original name, and at the Revolution had in France 24 monastic houses, including one in the Rue St. Honoré, Paris.

**Feuillants.** Name of one of the parties that sprang up during the French Revolution. It was given to the members of a club because they met in the building in Paris formerly occupied by the religious order bearing this name. They originated with some Jacobins who, in 1791, refused to ask for the deposition of Louis XVI, and thereafter they formed the moderate wing of the revolutionary party.

They wished to maintain the constitution and to set up a stable government, and at the outset they called themselves the Society of Friends of the Constitution, but they never secured any great amount of support from the populace, although they were the largest party in the Constituent Assembly. Sieyès, Barère, and Lafayette were perhaps the most prominent members. Their wealth and their conservatism brought them under the suspicion of the extremists, and, after the rising of Aug. 10, 1792, their names were published as enemies of France. This put an end to their activities, although the name was still used to describe men holding moderate opinions.

**Feuillet, OCTAVE** (1821-90). French novelist and dramatist. Born at St. Lô, in La Manche, Aug.

11, 1821, he became an assistant to Dumas the elder. When he started on independent work he soon achieved considerable popularity with plays and with the novel, *Le Roman d'un Jeune Homme Pauvre*, 1858; this was followed by the



mystical romance *Histoire de Sybille*, 1863. In 1862 he was elected to the Academy, and was later made librarian at Fontainebleau. *Monsieur de Camors*, 1867; and *Le Journal d'une Femme*, 1878, were the more notable of his later works. His stories are characterized by a blend of romanticism and realism. He died in Paris, Dec. 29, 1890.

**Feuilleton** (Fr., leaflet). French word for the part of a newspaper, usually the lower part of a page, devoted to gossip, literary, artistic or dramatic criticism, and especially serial fiction. The practice, though not the name, has been traced to the section in Defoe's *Review* headed *Mercur Scandale*, but the *feuilleton*, as at present understood, originated in the *Journal des Débats* in the early years of the 19th century.

**Fever** (Lat. *febris*). Condition of the body, the most characteristic feature of which is a rise of temperature. Accompanying symptoms are increase in the pulse-rate, headache, thirst, and, in the early stages, sensations of chilliness which in severe cases may amount to fits of acute shivering or rigors. The skin is usually dry at first, but later there is profuse sweating, and the skin is hot and flushed. The urine may be diminished in amount and is highly coloured. The tongue is often coated, and in children vomiting is frequent. The normal temperature of the body in health varies between 98° and 99° F. Up to 102° F. the fever may be spoken of as "moderate." Temperatures of 105° or 106° are high, and above 106° the term *hyperpyrexia* may be employed. A temperature of 107° F. is very grave and recovery is improbable.

The cause of fever is most often the circulation of a poison in the blood, this toxin upsetting the temperature centre in the brain, and in most cases the poison is a product of bacterial activity of an acute infectious disease. It is now recognized that the rise of temperature indicates the reaction



Ludwig Feuerbach, German philosopher

of the body against the poison in the blood, and, provided it does not reach a dangerous height, it is to be regarded as a beneficial process. The treatment of fever depends upon the disease with which it is associated. Over-high temperatures may be reduced by cold sponging, or the application of an ice-pack.

Certain clinical terms are used to describe various types of fever. Continued fever is the condition in which the fever remains persistently high; in remittent fever there are daily fluctuations of two degrees or more; and in intermittent fever the increased temperature is only present during part of the day. In malaria, when there is a daily rise of temperature, the condition is termed quotidian; when the rise occurs on alternate days the fever is said to be tertian; and when two days elapse between the paroxysms it is quartan. *See* Scarlet Fever.

**Feverfew** (*Matricaria parthenium*). A perennial herb of the family Compositae. A native of Middle and S. Europe, it has small, clustered, daisy-like, yellow-centred, white flower-heads. The leaves are deeply cut into toothed oblong segments. The whole plant has a bitter, tonic smell, and was used as a rustic medicine in slight fevers. The name, formerly spelt



Feverfew. Plant and flower of this medicinal herb

feverfuge, is derived from Lat. *febrifugia* (*febris*, fever; *fugare*, to drive away).

**Fever Hospital.** Hospital for the reception of patients suffering from infectious diseases, *e.g.* scarlet fever and diphtheria. Such a hospital should be built on a site with a dry subsoil and good fall for drainage. It should be outside the town which it serves but with good facilities for access, and there should be ample grounds. There should be a detached administrative block, separate

wards for patients suffering from different diseases, and out-buildings such as laundry, stores, mortuary, and disinfecting chamber.

In the wards of hospitals the minimum floor space should not be less than 144 sq. ft., and the minimum cubic space 2,000 cubic ft. per head, the system of ventilation providing that air is changed three or four times an hour. A system of one-storeyed pavilions is the best. These should be connected with each other by corridors open to the air. Isolation hospitals for smallpox require a larger space around them than hospitals for other infectious diseases. *See* Hospital.

**Fez or TARBUSH.** Close-fitting cap of felt with a flat top, usually red with a black tassel. It was worn chiefly by the Turks with or instead of a turban (*q.v.*). The name comes from Fez, in Morocco, where these caps were originally made. *See* Cap colour plate, facing p. 1705.

**Fez or FAZ.** City of Morocco, and the northern capital. It is situated in a valley about 100 m.

E. of the port of Rabat (*q.v.*), and is one of the sacred cities of Islam. The city, surrounded by ancient walls, is picturesque, and contains the Mosque of the Cherubim or of Muley Edris, to which is attached a Mahomedan university, once the centre of learning in N.W. Africa, with a library containing some 30,000 MSS. The city, which was founded in A.D. 808, is connected with Rabat by a light railway opened 1915. Pop. 144,424.

**Fezzan.** Country occupying the S. portion of the N. African colony of Libya. It was occupied by Italian troops towards the end of 1913. Fezzan extends some 400 m. N. and S., and 300 m. E. and W., and belongs to the desert region. The inhabitants are mostly Mahomedans belonging to the Sunnite sect. The chief oases are Ghat in the extreme S.W. and Murzuk. During the campaign of the Second Great War in N. Africa, it was announced on March 6, 1942, that Free French forces from Equatorial Africa had captured three Italian posts in Fezzan after a march of 900 miles. In Dec. Free French motorised

columns again invaded Fezzan, and advancing N. took Ouin-el-Arameb, the main Italian outpost, on Jan. 6, 1943. The conquest of the territory was completed by the capture of Murzuk on Jan. 12.

**Frangcon-Davies, GWEN** (b. 1896). British actress. Daughter of the singer David Ffrangcon-



G. Ffrangcon-Davies, British actress

Davies, she was born in London, Jan. 25, 1896, and educated at Hampstead. She sang soprano lead at the Glas-tonbury festival, 1919-20, and then scored her first great success as Etain in *The Immortal Hour*. An actress of unusual emotional range, she created the part of Eve in *Back to Methusalem* (*q.v.*), 1923, and became famous by her portrayal of Elizabeth Moulton-Barrett in *The Barretts of Wimpole Street*, 1930. Other memorable parts included



Fez. A street scene in the old part of the city

those of Anne of Bohemia in *Richard of Bordeaux*, 1932; Mary Stuart in *Queen of Scots*, 1934; Mrs. Manningham in *Gas Light*, 1939. In the Second Great War she toured S. Africa with Marda Vamne.

**Fiacre** (Fr.). Name of a saint and of a hackney carriage. The saint, also known as S. Fiachrach, a native of Ireland, died at Breuil, near Paris, about 670, and is commemorated on Aug. 30. Outside the Hotel de S. Fiacre, in Paris, in the 17th century, was the first stand for hackney carriages, and hence, it is supposed, is derived the application of the name *fiacre* to the vehicle. *See* Cab.

**Fianna.** In early Irish legend, the militia of Ireland, under the leadership of the warrior Finn, later known as Finn mac Cumhal. Their feats bear resemblance to

those of the Arthurian Knights of the Round Table. Cailte, the swift runner, and Oisín (Macpherson's Ossian), son of Finn, were prominent members of the Fianna. In later legend they appear in the reign of Cormac mac Airt, an Irish king of the 3rd century A.D., by whose son Coirpre they were finally quelled at the battle of Gabra, 283. The Anglicised form, Fenians, gave its name to the Fenian Brotherhood, an Irish political organization founded in the 1840s.

**Fianna Fáil** (Soldiers of Destiny). Irish political party formed by Éamon De Valera (*q.v.*) in 1926, when he broke away from Sinn Féin and the I.R.A. The party entered the Dáil in the second general election of 1927; in 1932 it achieved its first majority and came to power, and its majority subsequently increased until it held in the 1947 Dáil a total of 76 seats against 27 of Fine Gael. After the 1948 elections it still led with 68 seats, but lost its majority and was voted out of office. Fianna Fáil's period of power was marked first by the abolition of the oath of loyalty to the British crown. Later it abolished the post of governor-general, reconstituted the senate, and introduced the constitution of 1937 in which the state was named Éire. *See* Éire.

**Fiar**. In Scots law, name given to the ultimate owner of an estate, the one in whom the ownership is really vested. The *fiar* is, therefore, the opposite of the life renter.

**Fiat** (Lat., let it be done). Term used in English law for a short order, usually permitting something to be done, made by a judge or high official. Thus a judge's order is required before a newspaper can be prosecuted for libel.

**Fiat** (abbrev. of Ital. *Fabbrica Italiana Automobile Torino*). A motor, aircraft, and general engineering works at Turin, Italy. Fiat aircraft and aero-engines equipped a large proportion of the Italian air force in the Second Great War; the fighters that escorted the sole Italian raid over Great Britain on Nov. 11, 1940, were of the Fiat C.R. 42 type. The works were frequently bombed by the R.A.F., one of the earliest raids being on Nov. 8, 1940, by bombers making a non-stop flight from England of 1,600 m. Another heavy raid was on Jan. 12, 1941; and on Sept. 9, Stirlings and Halifaxes delivered a low altitude attack. The first 8,000-lb. blockbuster used by the R.A.F. was dropped on the Fiat factory on Nov. 2, 1942.

**Fibiger**, JOHANNES (1867–1928). Danish pathologist. Born at Silkeborg, Jutland, April 23, 1867, he was educated in Denmark and attended medical schools in Germany and Austria. He turned his attention to cancer research, was president of the international conference for cancer, 1913–1920, and was awarded the Nobel prize for medicine in 1926. He died at Copenhagen, Jan. 30, 1928.

**Fibre** (Lat. *fibra*, filament). Term used for threadlike construction or appearance of many substances. Hair, wool, silk threads of the cocoons of silkworms, parts of leaves, bark of certain trees, grasses, etc., are all fibres. Though under certain conditions some metals exhibit a fibrous construction, it is difficult to separate the fibres, but occasionally metals spun into fine threads are spoken of as metal fibres, as also is spun glass. With the exception of asbestos, the fibres of which are woven into a kind of cloth, the fibres of commerce can be conveniently divided into two classes, animal and vegetable.

Animal fibres are the wool and hair of animals, and the silk of insect cocoons. Though comparatively few animals produce commercial fibre, these few are of great importance. Sheep's wool, mohair from the Angora goat, the hair of the llama and alpaca, and those of the cow, camel, and rabbit—the last for felts—and horsehair are the chief commercial animal fibres, and their uses are dealt with under their respective headings.

Vegetable fibres constitute a large and important class, and are put to a greater variety of uses than animal fibres. Flax, China grass or ramie, hemp, jute, cotton, raffia, sisal hemp, tampico, coconut, esparto grass, and Mexican whisk or broom root are among the chief vegetable fibres.

The grasses or fibres of S. America and Africa are collected and sent over to importers in the British Isles, who sell them to the dressers, who in turn cut the fibre to different lengths for various uses and sell it to brush-makers. Brush-making is an important industry, and an enormous amount of fibre is used, some brush-makers dressing and cleaning their own raw material. The fibre is cleaned of all dirt, cut, and hackled to make it clean and strong; then cut again, dyed if necessary, steamed and so made straight, and then it is left to dry hard.

Palmyra fibre, commonly known as bassin in the brush trade, is a

strong, medium-sized fibre, and is often dyed to look like Bahia piassaba, which is the best material for street brushes, etc. Mexican fibre, of which there are two kinds—tula, which is short, and jumava, a longer variety—is a white fibre which, when dressed, is used for toilet hair brushes, nail brushes, etc. Coco fibre from the husk of the coconut is used for making mats, and also for domestic brushes and brooms.

The principal use of coir yarn is for thatching, though it is sometimes used for large mats. Piassaba, the most important fibre in the brush trade, is used for all kinds of brushes and brooms, and is found chiefly in Brazil and W. Africa. It is also largely used in S. America for rope-making. Kitool, from Ceylon, is the aristocrat of fibres; it is polished and treated with oil, and is expensive. It is used for making fine brushes and also for the manufacture of ropes of good quality.

#### Various Fibres for Many Uses

Such brushes as dandy brushes for horses are generally made from Mexican fibre. Animal fibre—horsehair, badger's hair, sable, and camel's hair—is extensively used in brush-making. Cheap fibres which pulp easily are used for paper-making. Among them are esparto grass, the paper mulberry (the bark of which is converted into paper extensively used in Japan), cotton grass, and Decan hemp. From the leaves of *Carludovicia palmata* is obtained the fibre from which Panama hats are manufactured; from *Cibotium barometz*, a fern growing in the Sandwich Islands, comes a variety of vegetable silk used for stuffing upholstery work, especially in the U.S.A.; and from *Eriodendron anfractuosum* comes kapok, a soft, silky, elastic fibre used in upholstery, for the stuffing of cushions, seats, etc. *See* Asbestos; Cotton; Flax; Hemp; Jute; Paper; Rope; Silk; Sisal.

**Fibrin** (Lat. *fibra*, filament). Threads of solid proteid formed in the process of coagulation of blood. The fine threads entangle the corpuscles of the blood and, gradually shrinking, squeeze out the fluid part of the blood or plasma, the solid mass of fibrin and corpuscles forming the clot. *See* Blood.

**Fibroid**. A tumour composed mainly of fibrous tissue, more correctly called a fibroma (*q.v.*). A common tumour of the uterus is spoken of as a fibroid, but is really developed from the muscular tissue. *See* Uterus.

**Fibrolite.** Fibrous massive variety of sillimanite. It has the same chemical composition as andalusite and kyanite ( $Al_2SiO_5$ ).

**Fibroma.** Tumor composed mainly of fibrous tissue. Soft fibromata most frequently develop from the connective tissue of the skin, and may form pedunculated outgrowths. Hard fibromata are found in connexion with the periosteum or tissue covering the surface bones, the ear, and other parts.

**Fibrositis.** Disease of an inflammatory nature affecting the fibrous tissue or fascia which surrounds muscles and extends between the muscular fibres. Pain is the most prominent symptom. The causes of the disorder are exposure to cold and wet, sudden chilling after heavy labour, and sometimes a blow. Persons of gouty tendency are most likely to be affected. See Lumbago; Pleurodynia; Stiff Neck.

**Fibrous Tissue.** Tissue composed chiefly of bundles of fine white fibres. It is found in tendons, ligaments, fascia, and the deeper layers of the skin.

**Fibula** (Lat., buckle). Outer of the two bones which form the skeleton of the lower leg. It is a long, slender bone, firmly attached to the tibia by ligaments at its upper and lower extremities. The lower extremity forms the external malleolus or bony protuberance on the outer side of the ankle, and helps to form the socket in which the foot articulates with the bones of the leg. See Leg.

**Fibula** (Lat.). Brooch or clasp, especially of the early metallic ages. The neolithic bone pin, often made from the splint bone or fibula of a vertebrate animal, was imitated in bronze; when bent over until the looped head clasped the point the safety-pin resulted. Common in Italian pile-dwellings, and the early Aegean, it developed at Hallstatt a bolder bow, often much decorated. Under

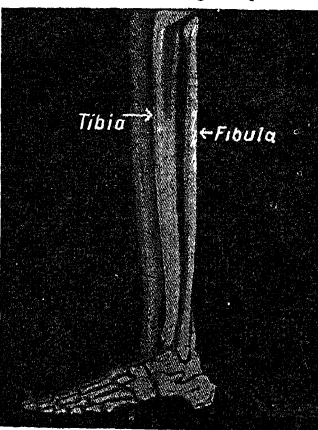


Fibula. Merovingian bronze-gilt brooch set with garnets, 7th cent.

La Tène influence three further stages are traced, the catchplate being bent back so as to (i) approach, (ii) clasp, (iii) unite with the bow. This sequence serves to date iron-age antiquities wherever these types are found. Unlike these late-Celtic forms, the Roman fibula

was in two pieces. Anglo-Saxon types, sometimes betraying continental influence, mostly display native developments, especially in *cloisonné*. The choicest Gaelic examples came from Hunterston, Tara, and Aesica. They are now in Edinburgh, Dublin, and Newcastle respectively. See Brooch.

**Fichte**, JOHANN GOTTLIEB (1762–1814). German philosopher. Born at Rammenau, Lusatia, May 19, 1762, he left Jena university owing to poverty, and in Switzerland became acquainted with Kant's philosophy. The attention attracted by his *A Critique of All Revelation*, written while he was a tutor at Königsberg, helped him



Fibula. Diagram illustrating relative positions of tibia and fibula in the human leg.

to obtain the professorship of philosophy at Jena. In 1798, having been accused of atheism, he resigned his post and retired to Berlin, where he was allowed to lecture on philosophy. In 1807, when the French invaded Prussia, Fichte showed his ardent patriotism in his *Addresses to the German Nation*.



He died at Berlin, Jan. 27, 1814, from a fever contracted during the war of independence.

Fichte's system has been

*Johann Gottlieb Fichte*  
After Büry

called practical idealism, according to which the power of the will in the Ego is supreme. The Ego or self is a purely active being, which derives from itself the entirety of knowledge. It is to the Ego that we have to look for the explanation of everything. The Ego, feeling itself limited,

"posits itself" as determining the non-Ego. The counterpart of whatever belongs to the Ego belongs to the non-Ego. The Ego created the non-Ego; it creates nature and God. But God is not merely a creation of the Ego, but the absolute Ego, the infinite will of the universe, the source of the finite Ego, to which we must ever strive to become united. Fichte's most important work is *The Foundation of the Whole Doctrine of Knowledge*, 1795.

**Fichtelgebirge.** Mountain system of Germany. Its central nucleus is situated in N.E. Bavaria between the basins of the Regnitz and the Naab. The name is derived from the pine trees (*Fichte*), with which it is largely covered. From it flow the rivers Eger, Saale (to the Elbe), Naab (to the Danube), and Main (to the Rhine). The principal summits are Schneeberg (3,450 ft.) and Ochsenkopf (3,334 ft.). It has connexions with or ramifications into the Erzgebirge and the Thuringian Forest, and contained spas and pottery and china works.

**Fiction** (Lat. *factio*, feigning). Term now applied almost wholly to prose romances or novels, although strictly it means anything that is feigned, and is applicable to any literary productions of the imagination. See Literature; Novel; Romance.

**Fiction, LEGAL.** Legal phrase denoting an assumption of fact without question of its truth, for the purpose of evading technical difficulties. Fictions occur in every system of jurisprudence. They have been invented to enable changes to be effected in the substance of the law while deferring to the wholesome imaginative reverence for its old symbols and formalities. Fictions of law are not allowed to be denied, their proper operation, according to Blackstone, being "to prevent a mischief, or remedy an inconvenience, that might result from the general rule of law," while further the maxim is invariably observed that no fiction shall extend to work an injury.

In England it was through fictions that the courts of king's bench, exchequer, and common pleas encroached on the previously distinct jurisdiction of one another. By the common law no mere civil action could be prosecuted in the king's bench, but plea of any civil action could be held there, other than actions real, if the defendant was an officer of the court, or in the custody of the marshal of the court, for a breach of the peace or any other offence; hence the fiction was introduced into the

pleadings that the defendant had been arrested for a supposed trespass, and so, being in the custody of the marshal, could be proceeded against for any other personal injury.

Similarly in the court of exchequer, personal actions were gradually admitted by the fiction that the plaintiff was the king's debtor, and was prevented from discharging his liability by the failure of the defendant to pay. By another fiction, actions for ejectment were made to serve the purpose of claimants to land, the names John Doe and Richard Roe being employed as those of an imaginary lessee and wrongful ejector.

Other fictions impose a conventional rule where exact facts are difficult to ascertain. *e.g.* the law takes no notice of fractions of a day, so that if a thing is to be done on a certain day, as payment of rent on quarter day, the whole day is allowed for its performance.

Again, in determining the exact moment at which a person becomes 21, the law, in general, disregards fractions of a day. This has a curious result. The law will not inquire as to the particular moment in the day at which the infant was born, and therefore considers that 21 years have elapsed since his birth at the close of the day preceding the 21st anniversary. There is, however, a legal maxim that a day that has begun is regarded as completed; so that at the first moment of the day preceding the infant's birthday, he becomes 21.

**Fiddle.** Old English name for the violin and its ancestors. It denoted originally any stringed instrument played with a bow, but came in time to be applied chiefly to the smaller sizes of such instruments. Fiddle, with viol, is connected with the Latin *vitulari*, to celebrate a feast.

**Fidei Commissum** (Lat. *commissum*, entrusted; *fidei*, to good faith). Term of Roman law. By the civil law of Rome, a citizen could neither make a foreigner his heir nor leave him any legacy. As foreign settlers (*peregrini*) became more numerous in Rome, citizens often desired to leave their property, or part of it, to some foreign friend. The only way to do this was to leave the property to a citizen, asking him to carry out the testator's wishes, and hand the property over to the foreigner. At first it was entirely optional on the heir whether he carried out the request or not. It was left to his faith. But, in the end, *fidei commissum* became legally enforceable.

**Fidelio.** Opera in 2 acts by Beethoven. Listed as opus 72, this work was the composer's only opera. Based on Bouilly's *Léonore*—an heroic episode during the French Revolution—the libretto was recast by Sonnleithner, and the work, the sub-title of which was *Die Eheliche Liebe* (Wedded Love) was given in 3 acts at Vienna, 1805. Shortened and revised, it was performed the following year, but withdrawn by the composer. *Fidelio* was given in its present form at Vienna in 1814. It has been said that Beethoven in this work appears to forget the characters and lose himself in contemplation of a moral idea; albeit *Fidelio* must be considered important in the history of opera. The famous *Leonora* overtures were written for this opera: No. 2 for the first production, No. 3 for the revival, No. 1 for a projected performance at Prague, which never materialised. The *Fidelio* overture preceded the final revision of the opera in 1814.

**Fidelity Guarantee.** Contract by which a person or persons undertake to make good losses due to fraud or negligence on the part of another person occupying a position of trust. Banks and business houses frequently require a guarantee of this kind on behalf of such of their employees as handle large sums of money, and many insurance offices, in return for an annual premium, enter into guarantees of this kind. Guarantee societies exist for the same purpose. *See* Guarantee; Insurance.

**Fidenae.** Italian town of Latium. It was situated about 5 m. N.E. of Rome, on a hill between the Anio and the Tiber. Frequently at war with Rome, it was finally conquered 438 B.C. and destroyed in the year following. Thereafter, though rebuilt, it never became a place of importance.

**Fides.** In Roman mythology, the goddess held as symbolical of faith and honour.

**Fiduciary Issue.** That portion of the note issue of a central bank which, by law, is not required to be covered by gold. The adjective is used in the sense of "held in trust." Fixing a limit to a fiduciary issue was originally necessary because of the tendency of central banks to overissue their notes, which became valueless. In the Bank Charter Act of 1844 the Bank of England fiduciary issue was fixed at £14,000,000; when in 1928 the treasury note issue was transferred to the Bank of England, the figure was raised to

£260,000,000; by 1939 the permitted issue outside the gold backing was £400,000,000. The need to free all gold held, and subsequently acquired, for overseas purchasing during the Second Great War, coupled with the constantly rising demand for currency, led to repeated additions to the fiduciary issue, so that by 1945 the figure had risen to £1,400,000,000. After the war national expenditure was three times that of the last pre-war years, and the fiduciary issue was maintained at a high figure; in 1950 it was £1,300,000,000.

Power to raise or reduce the limit rests with the treasury in consultation with the governor of the Bank of England, so that adjustments can be made as economic conditions determine. Notes within the fiduciary issue are secured by government securities; it is thus upon these rather than upon gold that currency now rests.

**Fief.** Name given to an estate held under the feudal system. It was, therefore, one which was held on condition of rendering certain services to an overlord, and which in certain eventualities reverted to that lord. The word is sometimes rendered in English as *feu* or *fee*. From it come *feoffee*, the one who receives the estate, and *feoffment* (*q.v.*), the act of granting it to him. *See* Feudalism.

**Field.** Anglo-Saxon word, meaning the open country. It is now used for a piece of enclosed land *e.g.* a wheatfield, and by analogy we speak of a coalfield or oilfield. It is employed also in a military and sporting sense. In the former, field is a synonym for battle or battleground, *e.g.* the field of Waterloo. This use has many compounds, such as field ambulance, relating to war. In sport the field has various meanings, *e.g.* the horses in a race or the riders at a hunt meeting are the field; in betting parlance, the field signifies all those horses not quoted individually at odds, and in a sweepstakes all horses not drawn separately. Field sports are hunting, racing, and the like. Field events in athletics include putting the weight, throwing the discus, etc. *See* Cricket; Horse-Racing.

**Field.** In heraldry, the surface of an armorial shield on which charges are placed. The same term is applied to the body of a flag, *e.g.* the British white ensign is a red cross on a white field, with the union jack in a canton (*q.v.*).

**Field, THE.** London weekly journal devoted to all forms of sport, natural history, and



country life occupations. Founded Jan. 1, 1853, by Bradbury and Evans, it was first edited by Mark Lemon. Its prosperity dates from its acquisition in 1854 by Mr. Sergeant Cox, and the appointment in 1857 of J. H. Walsh ("Stonehenge") as editor. In 1928 it was acquired by Sir R. L. Harmsworth and Sir H. Harmsworth. B. Vesey-FitzGerald was editor 1938-46.

**Field, CYRUS WEST** (1819-92). American financier. Born at Stockbridge, Mass., Nov. 30, 1819, he made a fortune and retired from business at 33, when he became interested in the idea of the trans-Atlantic cable. In 1854 he organized the New York, Newfoundland, and London Telegraph co., and 10 years later persuaded the U.S. and British governments to confirm by soundings the existence of Telegraph Plateau in the Atlantic. The first cable was laid in 1859. Heavy financial losses necessitated Field's return to business, and he was an originator of the New York elevated rly. He died at New York, July 12, 1892. See Atlantic Cable.

**Field, EUGENE** (1850-95). An American poet and journalist, born at St. Louis, Mo., Sept. 2, 1850. During 1883-95 he contributed to the Chicago Daily News a column entitled Sharps and Flats. His poems include *A Little Book of Western Verse*, 1889, and *With Trumpet and Drum*, 1892, charming verses for children. His most attractive essays are collected in *The Love Affairs of a Bibliomaniac*, 1896. He died Nov. 4, 1895.

**Field, JOHN** (1782-1837). Irish composer. Son of a violinist, he was born in Dublin, July 26, 1782, and became an assistant in the London pianoforte shop of Clementi & Co. He made his debut as a pianist in London in 1794. In 1802 he accompanied Clementi to France and Germany and then settled at St. Petersburg as a teacher. He died at Moscow, Jan. 11, 1837. Field's nocturnes are reputed to have influenced Chopin in the writing of what was then a new form of composition. His seven concertos had a vogue, but are forgotten. Harty arranged a John Field suite in 1940.

**Field, MICHAEL.** Pseudonym adopted by two poets who worked in collaboration: Katherine Harris Bradley (born Oct. 27, 1846; died Sept. 26, 1914) and her niece Edith Emma Cooper (born Jan. 12, 1862; died Dec. 13, 1913). Their first joint work, *Bellerophon*, published under the names of Arran and Isla Leigh, appeared in 1881, and they made use of the

name Michael Field in 1884, when they published *Callirrhoe*. Later works included *The World at Auction*; *The Race of Leaves*; *Poems of Adoration*; *Cedar and Hyssop*; *Mystic Trees*. Consult biographies by M. Sturgeon, 1922; T. S. Moore, 1934.

**Field Allowance.** Emolument granted to an army officer on going into camp or taking the field on active service, in compensation for the extra expense of tent furniture, messing, etc. During the Second Great War the field allowance varied from 2s.-7s. 6d. a day for a second lieutenant to 10s.-£4 for a general officer, according to the theatre of operations. The highest field allowances were paid to officers serving in Burma.

**Field Ambulance.** Mobile unit of the Royal Army Medical Corps organized in companies to work with forward troops. Nowadays a field ambulance is completely mechanised and is staffed by 10 medical officers and 240 drivers, orderlies, and stretcher-bearers. It is equipped to receive casualties from the casualty clearing stations and has a mobile blood bank. The general principle of the field ambulance is to treat slight casualties which can be returned to their units, and to give primary treatment to serious cases pending their movement to a general or base hospital.

**Field Dressing.** Antiseptic dressing carried by officers and men of the British army and R.A.F. on active service. It consists of a pad of sterilised gauze, to which is fastened a length of bandage so that it can be securely fastened over a wound. The field-dressing is enclosed in a dust-proof wrapping and carried in a special pocket in the trousers or tunic.

**Fieldfare** (A.S. *feldefare*, field traveller). A bird of the thrush family (*Turdus pilaris*). Visiting

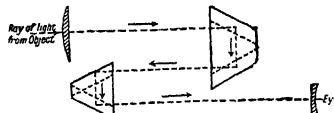


Fieldfare. Member of the thrush family, found in Great Britain

Great Britain in vast flocks in winter, it spends the rest of the year in Scandinavia and Russia. In plumage and general appearance it closely resembles the common thrush, but has not its vocal powers. It is seldom seen in

parties of less than twenty, and often the flock will exceed a hundred. It feeds upon grubs, small snails, and berries. When feeding it continually advances in one direction, and a flock of the birds appears to move forward in open order with almost military precision. Fieldfares nest in great colonies, and return year by year to the same site, the nests being usually built in pine woods.

**Field-glasses.** Small binocular telescope for viewing distant objects. The earlier field-glasses consisted simply of two short telescopes mounted side by side in a frame and focused by means of a screw. The telescopes were of the "Galilean" type, in which the object-glass is a convex lens which converts the parallel beam of light from a distant object into a convergent pencil of rays. The



Field-glasses. Diagram illustrating path of light in a prismatic field-glass

tube is a short one, and before the converging rays can come to a focus they pass through the concave eye-piece which transmits them to the eye as a parallel beam. In order that the images may be free from coloured fringes, it is necessary to substitute achromatic combinations for the simple lenses.

The advantage of this type of telescope for field-glasses lies in the shortness of the tube; its disadvantage in the narrowness of the field of vision. Rays from objects slightly off the direction in which the glass is pointed get lost inside the tube, and fail to reach the eye-piece. To avoid this defect, prisms were introduced into the tube to catch the aberrant rays and reflect them into the eye-piece. This was the origin of the modern form of field-glass, the prismatic binocular. There may be one object-glass or two, but in either case the entering pencil of rays is reflected twice or more between parallel prisms, and finally directed into the eye-piece. This arrangement gives a wider field than in the simple type of field-glass, but as a certain amount of light is lost at each reflection the field is not so bright. In fact, the prismatic binocular was rendered possible only by the invention of a glass for the prisms which reflected a specially large percentage of the light falling on it. See Telescope.

**Field Gun.** Mobile gun for use with troops in the field. That used by the British army in the First



**Field Gun.** Britain's 25-pounder in action. The standard gun for field artillery regiments

Great War was horse-drawn and sufficiently mobile to keep in touch with the advancing infantry. It had a calibre of 3.3 ins., fired a shell weighing 18½ lb. and had an extreme range of 9,000 yds. It weighed 1 ton 6 cwt., and the limber 15 cwt. Various types of field gun were developed for the British army in the Second Great War, but the most successful was the 25-pounder weapon, which became the standard gun for field artillery regiments. It had a calibre of 3.75 ins., an extreme range of 13,000 yds., and could be elevated to 45° and turn in its own length. The replacement of horse transport by mechanical traction has removed the limit to the size of field guns, and artillery up to 8-in. calibre now operates with troops in the field. *See* Artillery.

**Field Hospital.** Reception centre and clearing hospital for casualties removed from fighting areas by the field ambulance (*q.v.*). A field hospital, which was highly mobile and could move forward or back at short notice, was manned by the Royal Army Medical Corps (*q.v.*), one being attached to every division. When possible, use was made of existing buildings in the battle area, but in the campaigns in North Africa in the Second Great War the field hospital was accommodated in tents and marquees, which were carried by its own transport. A field hospital normally took 200-300 casualties, and was equipped with mobile operating theatre and X-ray equipment. It retained casualties only until their wounds had been dressed or emergency operations carried out, whereupon they were moved to a base hospital.

**Fielding,** HENRY (1707-54). English novelist. Born near Glas-tonbury, April 22, 1707, a scion of the Denbigh family, he was edu-

cated at Eton and at the university of Leyden, studying civil law. Coming to London about the age

of 20, he gave up his legal studies and began to work for the stage. He wrote a number of farces and other light pieces which have not lived. Called to the bar in 1740, he was appointed justice of the peace for Westminster in 1749 and proved a conscientious and painstaking magistrate. Careless living, however, had undermined his originally strong constitution. He died at Lisbon, whither he had gone for his health, Oct. 8, 1754. His *Journal of the voyage*, a delightful work, was also his last.

Fielding's first novel, *Joseph Andrews*, appeared in 1742. It began as a deliberate caricature of Richardson's *Pamela*, then just published. As the narrative progressed, Fielding became interested in his characters; the caricature fades into the background, and the result is a human and lifelike story. Joseph Andrews was followed in 1743 by *Jonathan Wild*, though it seems probable that this grim portrayal of the career of a consummate scoundrel was written first. Then in 1749 came *Tom Jones*, which some critics regard as the greatest novel ever written.



*Fielding*  
From a print

Sophia, the hypocrite Blifl, the egregious humbugs Thwackem and Square, and the ingenuous Part-ridge are intensely lifelike. "That exquisite picture of human manners," declared Gibbon, "will survive the palace of the Escorial and the Imperial Eagle of the House of Austria."

Fielding's last novel, *Amelia*, 1751, is subdued in tone as compared with the boisterous high spirits of *Tom Jones*. It is to a

certain extent autobiographical, the original of the erring Captain Booth being Fielding himself. *Amelia* was the favourite novel of Thackeray, who gives a masterly appreciation of Fielding in his *English Humourists*. There are other *Lives* or studies by A. Dobson, 1907; G. M. Godden, 1910; W. L. Cross, 1919; H. K. Banerji, 1930; B. M. Jones, 1933; M. P. Willcocks, 1946. *See* English Literature; Novel.

**Field-lens.** Part of an optical instrument. The more complex forms of eye-piece used in optical instruments consist of more than one lens in order that chromatic aberration and other image defects may be reduced. In both the Ramsden and Huygens eye-pieces there are two plano-convex lenses, the one next to the eye being termed the eye-lens, and the other the field-lens.

**Field Madder** (*Sherardia arvensis*). Annual bristly herb of the family Rubiaceae. It is a native



**Field Madder.** Spray of foliage and flowers, and a detached leaf

of Europe, Asia, and the Canaries. Its trailing stems, a foot or more in length, spread from the root, and are clothed with whorls of sharp-pointed lance-shaped leaves. The lilac funnel-shaped flowers are about ½ in. across. It grows in cornfields and pastures.

**Field Marshal.** Highest rank in the British army, equivalent to admiral of the fleet in the Royal Navy and to marshal of the Royal Air Force. The first English field marshal was William, earl of Salisbury, who in 1214 was appointed by King John *mariscalcus* of his military forces. At that time the marshal was responsible for maintaining order in court and camp. The modern sense, dates from 1736, when George II conferred the rank on John, duke of Argyll.



**Field Marshal.** Badge on shoulder

Any officer on either the active or the retired list may be promoted field marshal without reference to seniority, but it is laid down that there shall not be more than eight field marshals on the active list. The honorary rank of field marshal in the British Army is sometimes conferred upon foreign kings. Colonels commandant of the Royal Artillery and Royal Engineers, and colonels of the King's Royal Rifle Corps and the Rifle Brigade are selected from the field marshals, who are also eligible for appointment as governors of the Tower of London and of Chelsea Hospital. Rank is indicated by crossed batons surrounded by a wreath and surmounted by a crown. With full dress a baton is carried.

**Field Mouse.** A name erroneously given to several small rodents, both mice and voles. It is



Field Mouse. Brown long-tailed  
*Apodemus*

correctly applied only to *Apodemus*, the wood mouse, otherwise called the long-tailed field mouse, a common pest in most parts of England, in gardens and hedge-rows, and in corn-stacks.

**Field Officer.** Military officer above the rank of captain and below the rank of general: i.e. major, lieutenant-colonel, colonel, and brigadier. Before the age of mechanisation, field officers of infantry regiments were always mounted. Field officers not having any company or squadron responsibilities are generally assigned to special duties, such as presiding at courts martial. A brevet major ranks as a field officer for the period of his brevet, but performs company duties as required. Normally sentries pay compliments to field officers by presenting arms. See Brigadier; Colonel; Major.

**Field of the Cloth of Gold.** Term applied to the meeting-place of Henry VIII and Francis I of France, June 7-24, 1520. The meeting took place near Guines, and the name was given to it on account of the magnificence displayed on the occasion.

**Field Punishment.** Punishment authorised by the Army Act to be inflicted on private soldiers

on active service in consequence of the lack of prisons or detention barracks. Field punishment No. 1, abolished in 1923, involved such restraint as is usual in cases of imprisonment with hard labour, and in addition the prisoner could for three days out of four be "attached to a fixed object," such as a tree or a gunwheel, with straps or ropes, for not more than two hours a day. This mode of restraint could not, however, be adopted for more than 21 days in all. See Court Martial.

**Fields, GRACIE** (b. 1898). Stage name of Grace Stansfield, British variety and screen actress. Born at Rochdale, Jan. 9, 1898, she made her stage début as a child there, and appeared in London at the Middlesex music hall in 1915. Her broad, Lancashire humour, abundant vitality, and remarkably flexible voice rapidly endeared her to audiences, and she became the best known comedienne of the day, appearing in such revues as Mr. Tower of London, 1918-25; The Show's The Thing, 1929; Walk This Way, 1931. She made one appearance on the legitimate stage, in S.O.S. at the St. James's Theatre, 1928. In 1931 she made her film début in Sally in our Alley. Her later films included Queen of Hearts, 1936; Stage Door Canteen, 1943; Holy Matrimony (based on Arnold Bennett's novel, Buried Alive), 1943; Madame Pimpinel, 1946. She was created C.B.E. in 1938. She married first Archie Pitt, and in 1940 the Italian-born film director Monty Banks (d. 1950) shortly before he became a U.S. citizen, remaining with him for some years in the U.S.A.

**Fields, W. C.** (1879-1946). American actor. Claud William Dukenfield was born at Philadelphia, Jan. 29, 1879. He first attained fame as a juggler, and played in various parts of the world; after the First Great War he appeared in revues and comedies in New York, e.g. Scandals, 1922; Poppy, 1925. Then he began his film career and developed into a character actor, specialising in studies of alcoholic and humorous eccentrics. His portrayal of Micawber in David Copperfield in 1935 was probably his finest achievement. Later films included The Big Broadcast of 1938; My Little Chickadee, 1940; The Bank Detective, 1941. He died Dec. 25, 1946.

**Field Train.** Name formerly given to the transport attached to fighting units for the conveyance of the stores, supplies, and baggage necessary for their subsistence.

The term field train has now been replaced by the names first and second line transport: first line transport carries ammunition and rations, second line carries baggage. In infantry regiments each platoon has its own truck for first line transport. See Royal Army Service Corps.

**Fieri facias** (Lat., cause thou to be made). Term of English law. It refers to a writ of execution directed to the sheriff commanding him to seize and sell sufficient goods of a person against whom a judgement has been obtained to realize the amount of the debt.

**Fiery Cross.** Charred sticks dipped in goat's blood and usually joined in the form of a cross, which fleet-footed retainers of the chief carried round among the Scottish clansmen to call them together in time of emergency. Disobedience to the summons rendered any man between the age of 16 and 60 liable to the extreme penalties of fire and sword. During the "Forty-five" the fiery cross made many circuits. A fine description of the custom is given in Scott's Lady of the Lake, Canto III.

**Fiery Serpent.** Name given to the serpents sent to the Israelites in the wilderness (Num. 21). They were probably sand snakes, called fiery because of the effect of their bite. See Snake.

**Fiescherhorn.** Mt. of Switzerland. In the Bernese Oberland (*q.v.*), near Grindelwald, its height is 13,286 ft. The ascent from the Bergli Hut by the Mönch-Joch needs the help of a guide.

**Fieseler.** A German aircraft manufacturing company, founded by Gerhard Fieseler in 1930. During the Second Great War it produced the Fi 156, or Storch, designed for communications and army liaison work. This was a small three-seater monoplane with a single 240 h.p. Argus engine. The high wing was fitted with slots and flaps that permitted a landing speed of 24 m.p.h., and, in still air, a landing run of 27 yds., and a take-off in 51 yds.

**Fiesole** (anc. *Faesulæ*). City of Italy, in the prov. of Florence. It stands on an eminence overlooking the valley of the Arno, 3 m. N.E. of Florence. It was one of the 12 Etruscan cities, and is enclosed by crumbling cyclopean walls. Its cathedral, founded early in the 11th century, contains many interesting paintings and sculptures. Straw-plaiting is carried on by the inhabitants. Here in 225 B.C. the Gauls defeated the Romans, and

Sulla's veterans formed a colony, later the headquarters of Catiline. For long an opulent city, its prosperity waned as Florence grew in power. It was damaged, but not seriously, in the Second Great War; military operations passed over it in Aug., 1944. Pop. 10,434. *Pron.* Feeay-zolay.

**Fife** (Fr. *fifre*, Ger. *Pfeife*, Lat. *pipare*, to chirp, pipe). Small flute used in association with drums to accompany military marching when a full band is not available. In a drum and fife band the chief melodic work is allotted to the B flat fifes, arranged to play in unison or in two or three parts; they are assisted in lower notes by larger flutes, in F and in E flat, and in the higher ranges by piccolos (*q.v.*) in F and in E flat. As the open key of all the flutes is called D, transpositions are reckoned from D, instead of from C as with most other instruments. For example, the first two bars of God Save the King, in key B flat, would be written as follows to secure a unison effect:

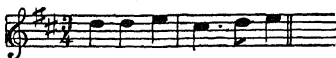
Piccolo in F.



Piccolo in E♭.



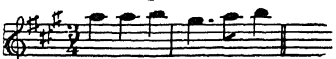
Fife in B♭.



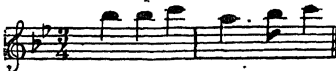
Flute in F.



Flute in E♭.



and the actual pitch would be:

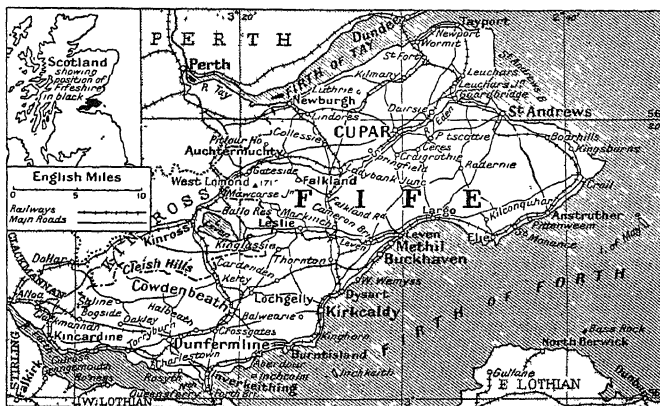


In fife bands the percussion instruments include side-drums, bass drum, cymbals, and triangle.

**FIFE** OR **FIFESHIRE**. Eastern maritime and peninsular county of Scotland. Lying between the Firth of Tay and the Firth of Forth, it covers 504 sq. m. The surface alternates between hill ridges and fertile and well cultivated valleys, the highest eminence be-



Fife arms



Fife. Map of the Scottish county between the Firths of Tay and Forth

ing West Lomond, 1,713 ft. There are several small lakes; the Eden and Leven are the largest rivers.

Nearly 75 p.c. of the soil is cultivated; wheat, barley, oats, and potatoes are raised. The mineral wealth of the county is large, represented mainly by coal around Cowdenbeath, but limestone, ironstone, freestone, and oil-shale are also worked. Most of the coast towns and villages engage in fishing, and the linen and floor-cloth manufactures are prominent.

The county of Fife returns four members to parliament, including one each for the Kirkcaldy and Dunfermline burghs. Cupar or Cupar Fife is the county town. St. Andrews is the seat of a bishop and an R.C. archbishop; has the oldest Scottish university; and is the headquarters of golf. Abernethy was a Pictish capital. Evidences of Roman occupation exist, and monastic ruins are found in many parts of the "kingdom," as the county is still popularly called. Pop. est. 286,600.

**LITERARY ASSOCIATIONS, ETC.** To Cupar belonged Sir David Lindsay, the 16th century satiric poet, and another of the Lindsays of Fife was Lady Anne Lindsay, who wrote Auld Robin Grey. Adam Smith was born at Kirkcaldy, and Balwearie, near by, was the birthplace of Michael Scott the "wizard." At Lower Largo was born Alexander Selkirk, who is immortalised as Defoe's Robinson Crusoe, and is the subject of a poem by William Cowper. Charles I was born at Dunfermline; his sister Elizabeth, queen of Bohemia, at Falkland; Richard Cameron at the same place; Alexander Henderson at Criech; Sir Robert Aytoun at Kinaldie; Thomas Chalmers at

Anstruther; Robert Adam at Kirkcaldy; Sir David Wilkie at Cults. King Alexander III was killed by falling from his horse at Kinghorn. St. Andrews, which is crowded with associations with notable students, has memories of George Buchanan and of John Knox, who began his work as reformer here.

**FIFE, EARL AND DUKE OF.** British titles borne by the family of Duff. In 1735 William Duff, who had been M.P. for Banffshire, was made an Irish peer, as Baron Breco. An earldom followed in 1759. James, the 4th earl, was a major-general in the Spanish army during the Peninsular War, and James, the 5th earl, was made a British peer as Baron Skene in 1857. He died in 1879.

His son and successor, Alexander William George Duff, was born Nov. 10, 1849, and was educated at Eton. He sat in the house of commons for the counties of Elgin and Nairn from 1874 until he succeeded to the peerage in 1879. In 1889 he married Louise, eldest daughter of the prince of Wales (Edward VII), and was created duke of Fife, with (1900) special remainder, in default of male issue, to his first and other daughters (by H.R.H. Princess Louise) and their male issue. He died at Assuan Jan. 29, 1912, from a chill contracted at the wreck of the steamer Delhi off Morocco, and was buried Aug. 8, at Braemar.

His daughter Alexandra, who succeeded as duchess of Fife, was born May 17, 1891, and on Oct. 15, 1913, married her cousin, Prince Arthur of Connaught (1883-1938). Their son Alastair Arthur (1914-43) was known by the second Fife title, earl of Macduff, until in 1942 he succeeded

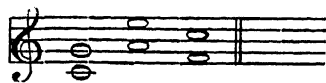
his paternal grandfather as 2nd duke of Connaught. On his death, Maud, younger daughter of the duke of Fife (1893-1945), became heiress to the dukedom of Fife. She married in 1923 Charles Alexander Carnegie (who in 1941 succeeded his father as 11th earl of Southesk), and had a son, b. 1929.

**Fifteen, THE.** Abbreviation for the Jacobite rebellion of 1715, against the Hanoverian dynasty. On Sept. 6 the earl of Mar raised the standard of King James III, the Old Pretender, at Braemar, but the attempt to restore the Stuart dynasty was defeated by Argyle at Sheriffmuir on Nov. 13. See Jacobites; James Edward.

**Fifteenth.** In English history, a tax usually associated with a tenth. Taxation of property other than land began in the time of Henry II, and in 1193 one-fourth of their incomes was demanded from laity and clergy alike. Succeeding taxes of this kind were levied, but the amount varied from a fourth to a fourteenth. Officials from the exchequer arranged for a fixed amount from each shire, leaving it to the sheriff to collect it from individuals. After 1290 it was a vote granted by parliament, each estate voting its own share to the king. Tenths and fifteenths became the regular amount of votes, townsfolk, i.e. the owners of personal property, paying one-tenth of their incomes and those in the country one-fifteenth.

The next charge was to make the amount voted a fixed sum, done by taking the assessment of 1332, which produced £39,000. Henceforward £39,000 represented a tenth and fifteenth, and if more money was needed parliament voted two tenths and fifteenths. In later votes certain towns were sometimes excepted, and the assessment became antiquated and unfair as conditions changed. The last vote of this kind was in 1624; its place being taken by the subsidy (q.v.). See Taxation; Tenth.

**Fifth.** Musical interval. A fifth includes five scale names in order, as C, D, E, F, G. Therefore C to G



is a fifth, and as G occurs in the major scale of C, this fifth is called perfect, or by some major. See Consecutive; Interval.

**Fifth Column.** Name given to any body of persons who work secretly against the established government, used particularly of

those who, during the Second Great War, sought to aid in the subjugation of their homeland by invaders. This phrase was first used during the Spanish civil war, 1936-39, when the Nationalists attacked the Republicans in four columns, while their supporters within Madrid spread alarmist rumours and committed acts of sabotage and espionage. Fifth columnists in Norway,



Fig. Specimen of the tree *Ficus carica* growing in Palestine. On the right are leaves and fruit of the tree, also enlarged flowers male (right) and female



the Netherlands, and N. France gave effective help to the Germans when they launched their campaign of 1940.

**Fifth Monarchy Men.** Sect of the Puritan period in England who believed that a millennium or kingdom of Christ upon the earth was at hand. This was to be the fifth monarchy of the world, the earlier ones being the empires of the Assyrians, the Persians, the Greeks, and the Romans. The Fifth Monarchy Men were to be found in considerable numbers in Cromwell's army. In 1661, shortly after the Restoration, they took part in a revolt in which many were killed.

**Fig** (*Ficus carica*). Tree of the family Moraceae, native of the Mediterranean region. It attains a height of 20 ft. to 30 ft., and has large, lobed, alternate leaves, rough above and downy beneath. The sexes are in separate flowers, but on the same tree. The minute blossoms are contained inside a hollow, pear-shaped flower-stalk. Externally nothing indicates the presence of flowers, and but for the ministrations of a small wasp

(*Blastophaga grossorum*), it would be impossible for the pollen of the males to reach the female flowers. In the same receptacle as the male flowers are some aborted females, and these are attacked by the female wasp, which lays its eggs in them.

The wasp-grubs feed upon their cradles, and in due time become wasps. In seeking the external air they have to pass among the male flowers, and get dusted with their pollen. Then they are attracted by the odours emanating from a cavernous stalk containing female flowers, and enter it, shaking off much of the pollen that covers their bodies; and thus the female flowers are pollinated and the flower-stalks become swollen and juicy. Numerous other species of the genus *Ficus* in other parts of the world bear edible fruit, such as *F. roxburghii* (India), which grows them in clusters from the bare trunk, quite near the ground.

**Figaro.** Central character, the barber himself, in Beaumarchais' comedy, *The Barber of Seville*. Valet, poet, dramatist, etc., he is the personification of the easy gaiety which has come to be accepted as a type of the witty social philosopher. Encouraged by the success of *The Barber of Seville*, 1775, Beaumarchais wrote *The Marriage of Figaro*, which, however, was not acted until 1784, and he also introduced Figaro into *La Mère Coupable*, 1792. Mozart wrote an opera on *The Marriage of Figaro*, and Paisiello and Rossini each wrote one on *The Barber of Seville*. See Beaumarchais.

**Figaro, LE.** Satirical journal founded in Paris in 1826 and named after Beaumarchais' hero. Contributed to by Jules Janin, Alphonse Carr, and George Sand, it ran till 1833. The title was revived for a weekly started by J. H. de Villemessant, 1854. This became a right-wing morning daily devoted to politics and literature in 1866, its writers including About, Hanotaux, Loti, Rostand, and Barrès. Under the control (1901-14) of Gaston Calmette, who was shot by Mme. Caillaux, wife of the French finance minister. March 16, 1914, it enjoyed a great vogue. It published a literary supplement, and a monthly periodical, *Le Figaro Illustré*.

From the German occupation in 1940, *Le Figaro* voluntarily ceased publication rather than

cooperate with the Nazis. After the liberation of France, 1944, it soon reappeared, edited by Pierre Brisson. It trebled its circulation within a year and established itself as a moderate right-wing paper without specific party allegiance.

**Fighter.** An aircraft primarily intended for aerial combat. In the First Great War such aircraft were designated scouts because in the opening phase they were employed largely on reconnaissance; aerial combat had not become a reality. In 1915 these scouting machines were fitted with machine-guns, and their purpose changed; they were no longer observation aircraft but fighters, for their pilots were called upon to seek, engage, and destroy enemy aircraft. The type name was retained, however, until some years after the war ended.

The first scouts (or fighters) were capable of top speeds of only about 65 m.p.h., but by the end of 1916 British, French, and German machines were flying at over 100 m.p.h. Engine power rose from 80 h.p. to 200 h.p., and by 1918 some fighter aircraft went into action with four machine-guns installed. With few exceptions all these aircraft were biplanes. The general use of metal in the construction of fighter aircraft in the post-war years was followed by development of the monoplane type.

#### Increase in Engine Power

At the outbreak of the Second Great War British and German fighters were equipped with engines of more than 1,000 h.p. The essential requirements of all fighter aircraft were and remained abundant engine power, high speed, and formidable armament. Through increasing the h.p. of the engines used in 1939 from 1,030 to more than 2,000 in 1945, the fighter speeds rose from about 340 m.p.h. to more than 460 m.p.h. The machine-gun was gradually replaced by cannon and rocket projectiles. To enable the aircraft to operate at altitudes of 40,000–50,000 feet, special superchargers and special airscrews were introduced. The cockpits were sealed and pressurised to make it possible for the pilot to breathe at such altitudes. Petrol tanks could be dropped from the aircraft when the additional fuel they contained had been expended. The most important change in fighter design introduced during the war was the use of the gas turbine-driven compressor units producing jet propulsion. The R.A.F. and the Luftwaffe employed such

aircraft operationally in the last phase of the conflict, speeds of more than 500 m.p.h. being attained.

Closely related to the true fighter were the fighter-bomber and the night fighter. The former was a variant of the normal fighter. It carried bombs weighing up to 1,000 lb. on external bomb racks, and when so loaded was employed in low level attacks on small targets, either moving or static. For the night fighter, the primary task was engagement with enemy bombers. Its essential qualities were long range, speed, and powerful armament. Whereas the ordinary fighter aircraft was a single-seat machine, the night fighter usually carried a pilot and a navigator. Naval fighting aircraft, flown from the decks of aircraft carriers, were also extensively developed during the Second Great War. Arrestor gear and folding wings were included in their design. See Hurricane; Messerschmitt; Spitfire, etc.

**Fighter Command.** Operational command of the Royal Air Force responsible for the interception and destruction of enemy aircraft, the escort of bombers, the carrying out of offensive sweeps and patrols, and, in conjunction with Coastal Command, the protection of shipping. Fighter Command evolved from the squadron of reconnaissance, artillery spotting, and photographic survey aircraft which in 1912 formed the nucleus of the Royal Flying Corps. The machines were totally unfit for fighting and little was known about the implications of aerial combat. The only armament consisted of revolvers or rifles carried by pilots and observers.

In the early months of the First Great War, pistols, rifles, small grenades, and incendiary bombs were the sole armament of military aircraft. The scout aircraft performed the elementary functions of a fighter and air fighting tactics consisted in getting above an enemy aircraft and attempting to drop an incendiary bomb on top of it. Early in 1915 the Germans began to make armed reconnaissance flights and bombing raids over the British lines. To combat this new development of air warfare, a number of Bristol and Martinsyde scout aircraft were fitted with machine-guns on the side of the fuselage and set at an angle to clear the airscrew. Somewhat later, machine-guns were fixed to fire through the propeller, being actuated by a synchronising

gear. By 1918, fighter tactics became highly developed, but with one or two exceptions similar types of aircraft were used for both fighting and bombing.

After 1918, the development of aircraft with great range and heavy load capacity led to the evolution of aeroplanes designed for the specific purpose of bombing. To combat the bomber, designers concentrated upon the production of a high speed aircraft with a rapid rate of climb and sufficiently sturdy to carry eight machine-guns. This led to the evolution of the fighter pure and simple, and the establishment, July 14, 1936, of Fighter Command to develop and exploit the tactics of air fighting. The command was divided into groups, which were subdivided into wings, themselves consisting of several squadrons. The squadrons were stationed at aerodromes controlled by their appropriate groups and equipped with day or night fighters or fighter-bombers, according to the particular operational duties of the wing. Fighter Command coordinated not only the operations of the fighter squadrons, but of all other weapons used against hostile aircraft. It issued the orders and warnings which set the air defence system in motion.

#### Radio-Telephony Control

Aerodromes under Fighter Command were ranged in sectors, a specified number of sectors being controlled by one of the groups, and the groups themselves being under Command H.Q. An elaborate system of communications controlled the whole, and each sector controlled by radio-telephony the movements of all fighter aircraft in the air. Operations rooms at sector, group, and H.Q. plotted all information about hostile aircraft, and at Command H.Q. provided a picture of the entire air battle front. On all operational stations in wartime a squadron of fighters was kept at three-minute readiness to take the air upon receipt of orders from the controller.

Squadrons from Fighter Command accompanied the B.E.F. to France in Sept., 1939, but in the first months of war their activities were mainly confined to armed reconnaissance and the protection of aircraft engaged in aerial photography. With the German invasion of Norway, France, and the Netherlands, Fighter Command was called upon to take up its true rôle; but necessarily retained the bulk of its squadrons in Great Britain to repel anticipated



bombing raids. Its work was restricted to operations designed to delay the advancing enemy and cover the evacuations from Norway and Dunkirk.

Following the defeat of France, Fighter Command disposed its resources for the coming battle of Britain (*q.v.*). No. 11 group, protecting London, the Thames estuary, and S.E. England as far as Portsmouth and East Anglia, bore the brunt of the fighting. No. 10 group protected southern England W. of Portsmouth and also South Wales; No. 12 group the Midlands and east coast from Great Yarmouth to Scarborough. No. 13 group was responsible for the Tyne, Tees, Forth, and Clyde areas and the Scottish east coast. Squadrons from No. 13 had been the first units of Fighter Command to go into action over Britain, when they attacked the German bombers raiding the Firth of Forth on Oct. 16, 1939.

In July, 1940, immediately before the battle of Britain opened, Fighter Command had a front line strength of 640 aircraft, Hurricanes and Spitfires with a few Defiants. Against them the Luftwaffe was able to dispose 1,200 long-range bombers, 1,100 twin- and single-engine fighters, and 350 dive-bombers operating from aerodromes set in a great crescent from Amsterdam to Brest. During the battle of Britain, Fighter Command had the major share in destroying 1,733 German bombers. The command lost 375 pilots killed and 358 wounded in the battle.

#### Offensive Fighter Sweeps

With the decline of the raids on Great Britain, squadrons of Spitfires and Hurricanes were detailed by Fighter Command to sweep over N. France as escorts to groups of day bombers. The first all-fighter sweep was made Jan. 10, 1941, when 100 Hurricanes flew over the Pas de Calais, attacking enemy aerodromes and road and rail transport. On subsequent occasions 1,000 fighters a day were often engaged in such sweeps.

In Jan. also Fighter Command introduced intruder patrols. These consisted of night sorties over enemy territory for the purpose of shooting down German aircraft over their bases as they took off or returned from raids over Great Britain. Somewhat later the command put into service fighter-

bombers, dropping an average of 135,000 tons of bombs a year. Another development was the night fighter. In conjunction with the Fleet Air Arm, the command also provided pilots and aircraft for the fighters catapulted from merchant ships.

On Nov. 15, 1943, the command was temporarily suspended, defensive fighters being incorporated into a new command known as Air Defence of Great Britain. The fighters squadrons engaged in sweeps and those working in close support of the army were embodied in what was known as tactical air force (*q.v.*). But Fighter Command was reformed on Oct. 15, 1944. Throughout the Second Great War, the command lost 3,558 aircraft and suffered 12,481 casualties, of which 3,143 were pilots killed on operational sorties. See Air Defence of Great Britain; Air Fighting; Fighter; Royal Air Force.

**Fighting Fish.** *David Le Roi* Name given to various species of small fresh-water fish, *e.g. Betta pugnax*, found in Asia and Africa. The Siamese breed it for contests, as it fights furiously when matched with an opponent. It assumes vivid hues when excited.



Fighting Fish. Specimen of the Japanese *Betta splendens*

**Fighting France** (*La France Combattante*). Title adopted on July 14, 1942, by Free France (*q.v.*). The French National Committee (*q.v.*) felt Fighting France to be a more exact definition of the Free French movement, since it linked Frenchmen fighting outside France with those resisting the Germans inside the country. The French National Committee and the British government agreed that Fighting France was the symbol of resistance to the Axis (*q.v.*) by all French nationals, wherever they might be, who repudiated the capitulation of June, 1940, and that the French National Committee was the directing organ of Fighting France. See France in the Second Great War.

**Fighting Top.** In ancient naval warfare, a platform or large barrel high up on the mast from which heavy weights could be thrown into any vessel lying alongside, either to disable men or to drive a hole through the bottom of the ship. Later on, fighting tops were occupied by archers and riflemen; in sailing ships they were represented by the "tops," or platforms built at the head of the

lower masts, where picked marksmen were stationed during close-fought actions. From the mizen-top, the platform on the after-mast, of the Redoubtable the shot was fired that killed Nelson.

In the later years of the pre-Dreadnought era fighting tops were equipped with machine and light quick-firing guns for driving off hostile torpedo-craft, but as the size of the latter and the range of torpedoes increased, it became impossible to mount in these positions guns sufficiently heavy and far-reaching for the purpose. Warships continued to have large structures built high up on the masts, but these were occupied in action by the spotting officers and apparatus connected with fire-control. On some warships the foremast and fighting top were replaced by an armoured control tower, from which the main armament was ranged and fired. This tower was known as the citadel. See Battleship.

**Fig.** Walled oasis of Morocco, on the borders of Algeria. It lies 3 m. N.E. of Beni Unif, and 165 m. E.S.E. of Fez, and is a station on the rly. from Oran to Colomb Béchar. There are 250,000 date palms and a considerable trade is carried on with Morocco. The inhabitants belong to the Amour tribe. After a revolt in 1903, order was established by a French military mission. Alt. 2,700 ft.

**Figl, LEOPOLD** (b. 1902). Austrian politician. Born in Upper Austria, he studied agricultural engineering in Vienna and became an active member of the Clerical party led by Seipel, Dollfuss, and Schuschnigg. He was interned by the Nazis soon after their annexation of Austria in 1938, and spent some six years in Dachau concentration camp. Liberated in 1945, he reconstructed the R.C. or People's party, which at the general election of Nov., 1945, secured 51 p.c. of the seats. Figl was chosen chancellor of Austria, while the provisional holder of that office, the Socialist Karl Renner, became president.

**Figline.** Town of Italy, in the prov. of Florence. It stands on the river Arno, 15 m. by rly. S.E. of Florence. It manufactures wine and cutlery, and straw-plaiting is carried on. In the vicinity is Monte Ferrato (alt. 1,385 ft.), noted for its quarries of serpentine. *Pron.* Fil-yeeny.

**Fig Marigolds** (*Mesembryanthemum*). Large genus of fleshy herbs and sub-shrubs. Belonging to the family Ficoideae, they are

natives of hot, dry climates, especially S. Africa. The leaves vary greatly in the different species; the flowers are large and conspicuous, white, yellow or red, with many long, slender petals. See Ice-plant.

**Figueira**, GUILLEN (c. 1190-1250). One of the later Provençal troubadours. He was born at Toulouse, and is reported to have been a tailor. When the persecution of the Albigenses took place he wrote vigorously in their defence, and on the persecutors' capture of Toulouse took refuge in Italy. In the struggle between the Empire and Rome he sided with the former, and one of his *serventes* is a denunciation of the latter. He also composed some notable love songs. *Pron.* Feegay-eera.

**Figueras**. Town of Spain, in the prov. of Gerona. It stands in a fertile plain near the French frontier, 27 m. N.E. of Gerona on the Barcelona-Perpignan rly. The town is strongly fortified, with a citadel built by Ferdinand VI, which is considered a key to the frontier. There is important trade in soap, wine, leather, cork, and textiles. The town fell three times to the French—in 1794, 1808, and 1823. At the close of the civil war of 1936-39, following the fall of Barcelona, Jan. 26, 1939, the Spanish Republican government fled to Figueras, but the town was captured by Franco's forces on

Feb. 8, after a heavy toll of civilian life through bombardment. The last meeting of the Cortes was held here on Feb. 3, only 62 deputies being present out of 473. Pop. 15,680. *Pron.* Feegay-rahss.

**Figueras y Moracas**, ESTANISLAO (1819-82). Spanish statesman. Born at Barcelona, Nov. 13, 1819, he studied law. As a republican he was elected to the Cortes in 1851. Prominent in the revolution of 1868, he strongly opposed all attempts to restore the monarchy, and upon the establishment of the republic of 1873 became president of the provincial council of ministers. He occupied a prominent position in politics until 1874, when the restoration drove him into retirement. He died at Madrid, Nov. 11, 1882.

**Figurate Number**. Term used in mathematics. In an arithmetical progression, if the first number is a unit and the successive numbers differ from it by whole numbers, as in such a series as 1, 2, 3, 4, 5, then a new series may be formed by adding together the first two terms, then the first three terms, then the first four terms, etc. The new series would thus be 1, 3, 6, 10, 15. These numbers are called figurate numbers. Similarly another series, 1, 4, 10, 20, 35, etc., might be formed from the second series.

**Figured Bass**. In music, a bass part provided with figures to indi-

cate the chords which should be added to it. See *Basso Continuo*.

**Figure-Head**. Image painted or carved on the prow of a war vessel. It doubtless originated in the sentiment that a ship was a living thing and should be given in at least one respect the external appearance of one. Possibly, too, the ferocious aspect of a grotesquely shaped animal in the bows had some sort of moral effect upon ancient or uncivilized warriors.

In the days of the oared galley the figure-head was made to fill the purpose of an above-water ram. Projecting further in advance of the bow than the ram below water, it was driven with such force against an enemy's side as to cause the vessel to heel over, thus giving the submerged projection the opportunity of striking in a more vulnerable and vital part of the hull. When the sail superseded the oar as a means of propulsion, the figure-head ceased to have any practical value, but it was retained for ornament, and as an expression of sentiment. The Royal Sovereign, completed in 1880, was the last warship built for the Royal Navy to have a figure-head. In 1904 the *Swiftsure* and *Triumph*, built for Chile, were taken over by the Royal Navy, and both these vessels had bow scrolls. Many figure-heads of old British warships are to be seen in naval museums.

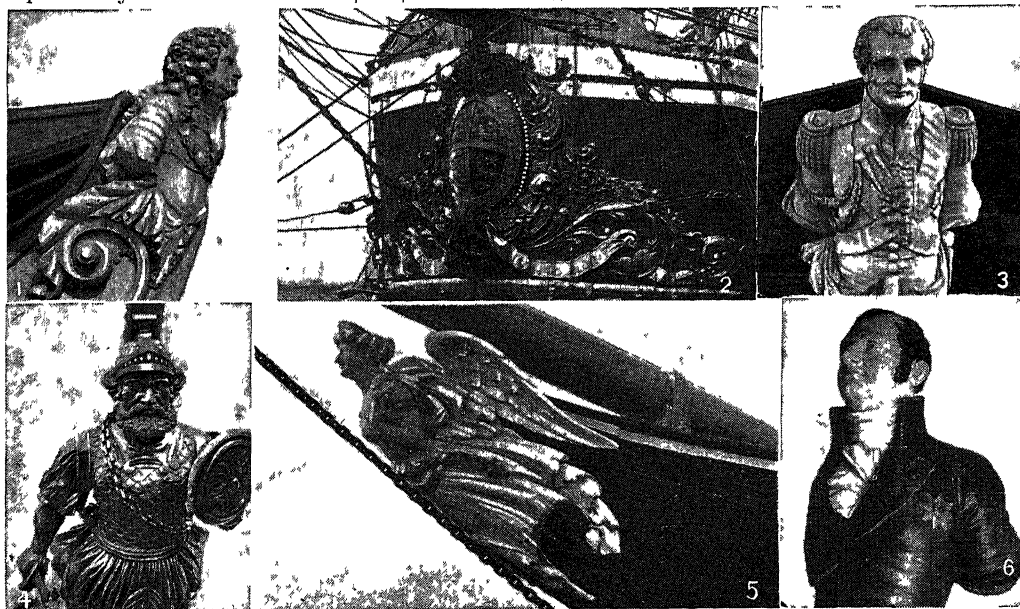


Figure-Heads in the Royal Navy. 1. Marlborough, old three-decker wooden sailing ship now in Portsmouth harbour. 2. Minotaur, ironclad cruiser built in 1863. 3. Duke of Wellington, built in 1852. 4. Warrior, the first ironclad, launched in 1860. 5. Iris, steam and sail ironclad built in 1877. 6. Figure-head intended for Royal Frederick, 1841.

Photos 1, 2 and 5, H. Symonds & Co., Portsmouth, 3, 4 and 6, Cribb, Southsea

**Figwort** (*Scrophularia*). Large genus of herbs, of the family Scrophulariaceae. They are natives of Europe, Asia, N. Africa, and America. They have tuberous or creeping rootstocks, opposite leaves, and somewhat globular flowers of a greenish-purple or yellow hue, succeeded by a two-valved capsule. As a rule they have an unpleasant odour. *S. nodosa*,



Figwort. Leaves and flowers of the knotted figwort

the knotted figwort, is used by farmers to make a decoction for the cure of scab in swine.

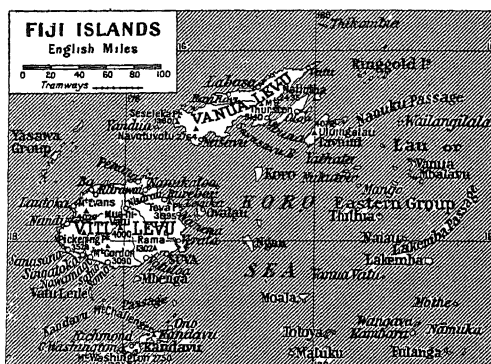
**Fiji or Viti Islands.** Crown colony of the British Empire. It consists of a group of nearly 250 islands and islets in the S. Pacific Ocean, lying mostly between lat. 15° and 20° S., and long. 175° E. and 178° W. The total land area, including Rotuma, is 7,083 sq. m. About 80 islands are inhabited, but only three are large: Viti Levu (area 4,053 sq. m.), Vanua Levu (2,130 sq. m.), and Taviuni (217 sq. m.); smaller islands are Ovalau, Kandavu, Ngau, Koro, and Rotuma. The remainder are islets and atolls, bounded by reefs.

The islands are of volcanic origin, but beyond a few thermal springs there are no signs of recent activity. The larger islands are mountainous, rising to 4,000–5,000 ft., densely forested in parts (2,366,000 acres under forest), abounding in valuable woods, but the sandalwood for which the Fijis were formerly noted is almost exhausted. There are many good harbours and a few navigable rivers. The climate is healthy and agreeable, the rainfall plentiful; the mean temperature is about 70°, and malaria is rare. The islands are subject to hurricanes between Dec. and

April. The soil is extremely fertile, the chief products being coconuts, sugar, cacao, yams, bananas, maize, rice, tobacco, rubber, and turmeric. Horses, asses, cattle, sheep, pigs, and goats are reared.

The chief exports include sugar, copra, molasses, cotton, rubber, green fruit, and sici shell. Steamer

communication is normally maintained with Australia, New Zealand, Honolulu, Canada, Tonga, and Samoa. About two-thirds of the trade is done with British possessions. There are seven wireless telegraphy stations, and cable communication with Aus-



Fiji. Map of the South Pacific islands ceded to Great Britain in 1874

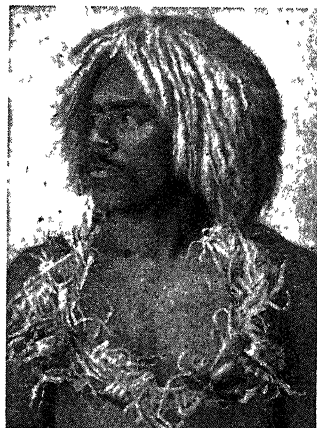
tralia is assisted by executive and legislative councils. A fair amount of self-government is allowed; local administrative units called *tikina* are under native chiefs. The governor is high commissioner and consul-general for the West Pacific. After the entry of Japan into the Second Great War in Dec., 1941, a Fiji defence force was formed. Fijian units served on Bougainville and in other operations in the S.W. Pacific. The islands were used by U.S. troops as a training ground in tropical warfare. They gave more than £52,000 to the Imperial govt. towards the war. Pop., est., 240,641: Fijians, 111,346; Indians, 109,488; Europeans, 5,245;



Fiji. Fijian girl. Right, native man of Malayan-Polynesian origin

tralia, New Zealand, and Canada. There are 384 schools, 23 being under government control. Religion is mainly Methodist and R.C. Money, weights, and measures are as in Great Britain. The capital is Suva (pop. 11,398) on the S. coast of Viti Levu.

The Fiji Islands were discovered by Tasman in 1643; visited by Cook in 1769; ceded by the ruling chiefs to the British Empire, Oct. 10, 1874. Under the constitutional arrangement of 1937 they are administered by a governor appointed by the crown, who



Chinese, 2,351; Melanesians, Polynesians, Rotumans.

**Filament.** A high resistance tungsten wire in an electric lamp which becomes incandescent when current passes through it. In ordinary lamps the wire is wound in a close coil. In "coiled coil" lamps the coiled filament is again coiled on itself, giving a concentrated light source of high efficiency.



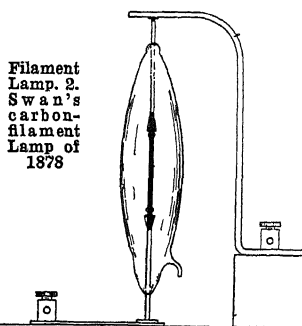
Fiji arms

**Filament Lamp.** Before 1878 the arc lamp had the electric lighting field virtually to itself. This form of lighting, however, was available only in inconveniently large units, and the problem of "subdividing the electric light" was urgent. The obvious method was to develop heat in a filament; but whereas existing conductors could produce a great deal of heat without destroying themselves, they could not emit an economic amount of light. In 1845 Staite, an arc lamp engineer, exhibited a lamp with a platinum-iridium filament in a vacuum, but found that the metal was rapidly dissipated by evaporation at a temperature that did not give rise to a useful amount of light.

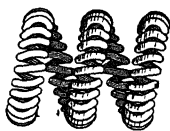
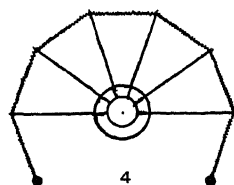
The curves in Fig. 1 illustrate the temperature requirements of a filament, showing the relative amount of energy radiated at the various wavelengths at four fixed temperatures. Since the only visible radiation is that between 0.4-0.7 microns, the small areas left shaded are alone useful for lighting purposes. Thus at 1,000° C. no light is given at all; at 2,000° C. only a small fraction of the total energy is useful; but further temperature rise causes a valuable increase in efficiency.

It was therefore necessary to find the material and the conditions of running that would permit the highest temperature to be maintained for a reasonable "life"; and 1,000 hrs. has always been regarded as the standard value for the latter. The chief requirement is evidently a high melting point; but all materials evaporate rapidly at temperatures well below this. The conductor with the highest melting point then known was carbon (3,500° C. as compared with 1,764° C. for platinum). Swan, who had seen Staite's demonstration,

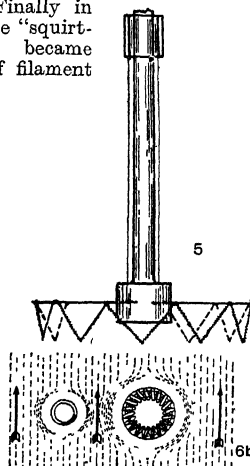
constructed a number of carbon-filament lamps from 1855, but no practical commercial model



till 1878 (Fig. 2). This lamp had a thin vertical rod of hard carbon, but about two years later he improved on this with a filament of cellulose drawn through a diamond die and carbonised. Finally in 1884-85 he developed the "squirt- ing" process, which became the standard method of filament making everywhere.



6a



Filament Lamp. Metal filaments: 3. Cage filament for vacuum lamps; 4. Wreath filament for small gas-filled lamps; 5. Festoon filament for large gas-filled lamps; 6a. Coiled-coil filament, greatly magnified; 6b. Comparison between coiled-coil, and coiled filaments, showing layer of inert gas around each

Carbon possesses the disadvantage of evaporating at a relatively low temperature, but it was not till 1898 that a better material was found, in the rare metal osmium, by Welsbach in Germany. This was followed by tantalum in 1903, but in 1904, before the latter could become established, the tungsten filament (m.p. 3370° C.) was developed in America. At first it was "squirted" in the form of a metal powder mixed with a binder and then calcined or sintered, but Lang-

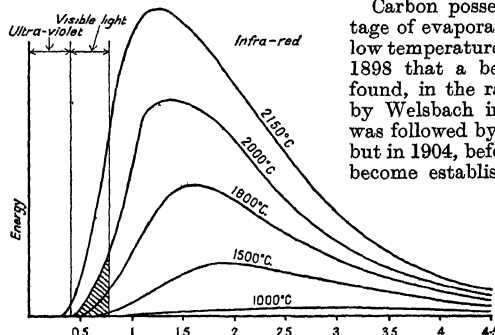
muir in 1906 discovered the process for wire-drawing the metal at a high temperature. The wire was wound between two molybdenum "spiders" in "cage" form (Fig. 3), and run in a vacuum of about 10<sup>-4</sup> mm. of mercury. Its efficiency had reached about four times that of the carbon lamp.

In 1913 evaporation was reduced by replacing the vacuum with a filling of inert gas, argon mixed with about 10 p.c. of nitrogen being found the most effective. To minimise convection loss, it was now necessary to concentrate the filament, by making it in the form of a closely wound spiral, which was supported as a horizontal wreath for the smaller lamps (Fig. 4), or festooned in a series of Vs (Fig. 5) for the larger. A whiter light was the result, with an efficiency about seven times that of the carbon lamp. A further improve-

ment was effected in 1936, by coiling the already coiled filament, as shown in Fig. 6a. This added a further 20 p.c. to the light output, making it about eight times that of the carbon lamp.

Filament lamps should be run at their correct voltage. If this is exceeded by 10 p.c., 38 p.c. more light is given, but the life falls to 300 hrs. instead of 1,000. Lamps for projection purposes are designed to run at about this intensity.

**Filangieri, GAETANO** (1752-88). Italian lawyer. The son of Caesar Filangieri, prince of Arianiello, he was born at Naples, Aug. 18, 1752, and became a lawyer. He is chiefly known for his work, *The Science of Legislation*, which secured a

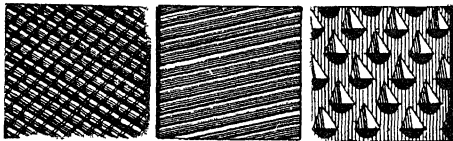


Filament Lamp. 1. Relative amounts of energy emitted by filament at various wavelengths in microns for 5 different temperatures. Energy used as visible light up to 2000° C. is shaded (see text)

European reputation. This is unfinished, only four out of its six books being completed; it deals with legislation, economics, and education, and shows its author as a thinker much in advance of his time. Filangieri passed much of his life in Spain, where he held appointments at court, and died at Vico Equense, July 21, 1788. The Science of Legislation was translated into English by Sir R. Clayton, 1806.

Filangieri had a son, Carlo (1784-1867), famous as a soldier in the French service. He began his career under Napoleon and saw service at Ulm, Austerlitz, and elsewhere. His name is chiefly associated with Sicily; in 1848 he was sent there by Ferdinand II, king of Naples, to subdue the rebels, and he remained in the island as governor until 1855. In 1859 he was made prime minister by Francis II, king of Naples, but he soon resigned because his suggestions for a more liberal form of government were rejected. Made prince of Satriano, he died Oct. 9, 1867.

**Filaria** (Lat. *filum*, thread). Genus of Nematode or threadlike worms, many of which are parasitic in the bodies of man and other animals. Certain of these minute worms are the cause of various diseases, most of them peculiar to tropical countries. *Filaria bancrofti* lives in its adult stage in the lymphatic glands, while its embryos, *Microfilaria sanguinis-hominis*, are found in the blood.



File. Left, double-cut rough file; centre, single-cut rough file; right, horse rasp, showing burrs

It is conveyed by the bite of a mosquito, and is the cause of elephantiasis and haematuria. Pathological changes are due partly to mechanical blockage of the lymphatics, and partly to toxins elaborated by the worms and to secondary invasion by streptococci. *Filaria medinensis* is known as the guinea worm, and encysts under the skin of the back and legs, forming subcutaneous abscesses. The larval stage is passed in the cyclops, and the larvae probably conveyed to man by impure drinking water. See Tropical Diseases.

**Filariasis.** Disease caused by infection with a nematode worm belonging to the family Filariidae. Several genera and species are

recognized, but by far the most important is the *Filaria bancrofti*. See Elephantiasis.

**Filbert.** Fruit of the cultivated hazel. In it the leathery husk is greatly extended so as to conceal the nut. Its proper name is Philibert nut, so called from S. Philibert, whose day is kept Aug. 22 during the height of the nutting season. See Hazel.

**Fildes, Sir Luke** (1844-1927). British artist. Born at Liverpool,

he studied at Chester, Warrington, South Kensington, and the Academy schools. He began his career with black and white work for The Graphic, contributing a sketch of Casuals for the first number, 1869; this was, in 1874, the subject of a popular picture at the R.A. He illustrated Dickens's Edwin Drood in 1870. The Doctor, 1892 (Tate Gallery), set the seal on Fildes's reputation as a painter of sentimentally pathetic subject pictures. In 1901 he painted the official portrait of Edward VII, and in 1905 that of Queen Alexandra. He was elected A.R.A. in 1879 and R.A. in 1887, and knighted in 1906. He died Feb. 27, 1927.



*Luke Fildes*  
Russell

**File.** Hand tool used for shaping and smoothing metal. Files are also used to sharpen saws. Many varieties are used: flat, taper, round, square, three-square or triangular, half-round, and rat-tail or tapered round. In flat files both faces

and edges may be cut; if one edge is left smooth the file is said to have one "safe-edge." The best files are made of the finest crucible cast steel; the cutting edges are formed by means of a short chisel, held at an angle on the "blank," as the uncut shape is called, and struck with a hammer. A rasp is a file in which a series of strong burrs are made by a pointed punch.

Standard files are single cut or double cut. The cutting begins at the point of the file and advances by steps according to the intended fineness of the file. After the first cutting is finished, if the file is to be double cut, it is gone over again with the chisel held so as to cross the former cuts at an angle. Cutting surfaces of files are distinguished in a complete series as rough, middle cut, bastard, second cut, smooth, and dead smooth. The sizes range from a watchmaker's tool, about three-quarters of an inch long, to files three feet in length. "Swiss" files of superhard steel have long held the field for jewellers' and watchmakers' work, making precision instruments, etc. Most files are provided with a "tang," a pointed end intended to be driven into a wooden handle. Files are cut while the blanks are in the soft or annealed state, and are afterwards hardened, great care being taken to avoid distortion of their shapes. Skill in filing, the ability to file a surface flat, is still the hall-mark of a good mechanic; though machine tools have somewhat diminished the importance of the art.

**File** (Lat. *filum*, thread). Military term for soldiers formed up behind one another. In the British army men fall in in three lines; those abreast form the ranks; each man in the front rank with the men immediately behind him forms a file. When numbered off, the front rank man numbers for his file. If the total of the men in the squad is not divisible by three, the last file but one, known as the blank file, has only one or two men.

**File Fish.** Member of the genus *Balistes* of the order *Plectognathi*, an order of sea fish.

**Filey.** Urban dist. and seaside resort of the East Riding of Yorkshire, England. It is 7½ m. S.E. of Scarborough on the railway, and is pleasantly situated on the cliffs



Filey. Filey Brigg, principal feature of the coast at this Yorkshire holiday resort

By courtesy of British Railways

overlooking Filey Bay. It possesses a fine stretch of firm sand, a good promenade, and golf links. Here is also situated a large permanent holiday camp. Filey Brigg, on the N. part of the bay, is a ridge of sandstone stretching  $\frac{1}{2}$  m. out to sea. S. Oswald's, a cruciform building, partly of Norman work, partly Early English, is the chief church. Until recently the boundary between the E. and N. Ridings of Yorkshire separated this church from the town proper. A gunnery school and infantry training centre were established for the R.A.F. Regiment at Filey during the Second Great War. Pop. 4,000.

**Filibranchiata.** An Order of molluscs belonging to the Lamellibranchiata, often called the bivalves. Members of this order have filamentous gills.

**Filibuster.** Term, probably of Dutch origin, originally applied to the buccaneers or 17th century pirates infesting the Spanish-American coasts and later to the irregular adventurers who organized expeditions in Spanish-American revolutions; e.g. Lopez against Cuba (1850-51), Walker against Nicaragua (1855-60). Metaphorically it denotes a member of an American legislature who attempts, either singly or as one of a group, by means of tactics permitted under its rules of procedure, to prevent or delay the passing of a resolution approved by the majority. In the U.S. senate in 1908 Senator La Follette spoke continuously for 18 hours against a currency bill, and in 1935 Senator Huey Long for 16 hours against the extension of the National Industrial Recovery Act.

**Filigree** (Lat. *filum*, thread; *granum*, grain). Form of decorative work carried out with fine wire of gold, silver, or copper. It has been used for jewelry and ornament from prehistoric times, sometimes alone, sometimes in combination with solid metal, enamel, and precious stones. The Etruscans and later the Byzantines combined filigree work with granulation—a type of decoration consisting of small and large balls. In early work the dainty wire patterns were attached to metal plates, and when the space between was filled with enamel it was known as filigree enamel. Treatment varies a good deal. Indian work is mostly floral, very thin wire filling in the space between the outline of thicker flattened wire. Maltese filigree is like cobwebby lace, as is much from Portugal.

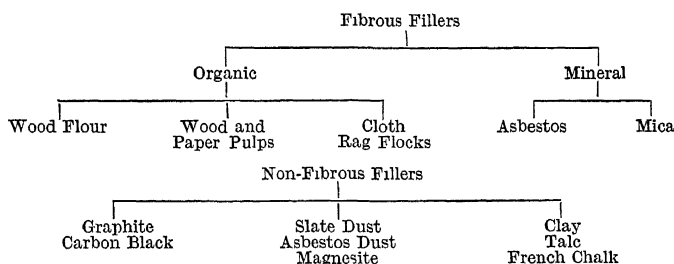
Apart from its use for articles for personal adornment, filigree decoration was used in medieval times to embellish reliquaries, and, from this, detached lacework in Gothic architecture is sometimes called filigree work. (See Byzantine Art, illus. p. 1607.)

There are two types of filigree glass: (1) interwoven or spirally twisted clouded or coloured threads embedded in the glass; (2) surface decorations or other ornaments carried out in glass threads.

**Filipinos.** Name applied generally to the native inhabitants of

**Filler.** A word used in several senses, e.g., a vessel for filling others; a man who fills barrows or trucks with excavated material in preparing ground for building and civil engineering works; and especially any packed material surrounded by wrapping.

More important is the use of the word to include fillers or extenders used in manufacturing processes to impart strength, durability, resistance to abrasion, good electrical properties, etc. The table shows a useful classification of fillers of this kind.



the Philippine Islands (*q.v.*). They belong to tribes of Malayan stock. The Liga Filipina was founded about 1890 by Dr. José Rizal (*q.v.*) with the object of securing more freedom for the inhabitants than they then had under Spanish rule, and subsequently the term Filipino came into general use.

**Fillan** (d. c. 777). Scottish saint. According to the Aberdeen breviary, he was the son of S. Kentigern, and early in life became a monk. He lived for some years in a cell near St. Andrews, where he was later elected abbot. He retired to Glendochart in Perthshire, where he founded a church. He was buried at Strathfillan. His festival is on Jan. 9.

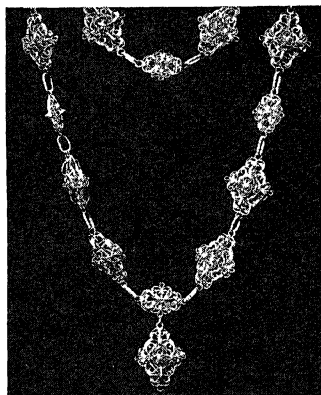
Most of these fillers are found useful in the manufacture of paper, plastics, paints, hard rubber, etc.

Barytes, chalk, china clay, gypsum, talc, silica, and slate dust are used as fillers in paint, not solely for the purpose of cheapening it but to improve its general qualities, notably durability. In paper-making, loading with such fillers as barytes, whiting, or titanium oxide, assists the production of a high degree of whiteness and opacity.

In the rubber industry (e.g. rubber tires), zinc oxide, carbon black, lamp black, and occasionally whiting and fossil meal increase durability, resilience, and resistance to weathering.

Synthetic resins and plastics, particularly of the bakelite type, mixed with such fillers as asbestos fibre, cotton flocks, wood flour, and mica, yield a powder which can be filled into the moulds of heated presses. Under the influence of heat and pressure the resin liquefies and, with the filler, bonds into an infusible form with great mechanical strength, good electrical properties, resistance to heat and temperature changes, and unaffected by moisture and solvents.

Vulcanised rubber for the electrical industries may be compounded with mineral fillers according to requirements. Powdered cork in linoleum; whiting and powdered graphite in solid lubricants; and mineral sub-



**Filigree.** Gold necklace of sixteenth century Venetian work

By permission of the Director, Victoria & Albert Museum, South Kensington



stances for loading certain textiles are other instances of the use of fillers.

H. M. Langton

**Fillet** (Old Fr. *filet*, little thread). Term in architecture, signifying a narrow moulding or flat band in a moulding. It is also used to indicate the flat ridge between the flutes of a shaft. *See* Fluting; Moulding.

**Fillmore**, MILLARD (1800-74). President of the U.S.A. Born Feb. 7, 1800, in New York state, the son of a settler, he had a rough boyhood. Apprenticed to the cloth trade, he began to study law, and earned a livelihood by teaching at Buffalo until qualified to practise. This he did at Aurora, where he was soon the head of a prosperous firm. In 1829 he entered the legislature of New York. In congress he sat as a Whig, 1833-35 and 1837-43, becoming a prominent speaker in the house of representatives. In 1848 he was chosen vice-president, and on July 9, 1850, on Taylor's death, he succeeded to the presidency.

On the slavery question Fillmore was a moderate. On the one side he pressed forward in 1850 the fugitive slave law and other measures of compromise; on the other he had supported legislation for preventing the extension of slavery outside the existing slave states. But the Whigs declined to put Fillmore forward again; when he stood for president, 1852, only one state supported him; and his term ended March 4, 1853. He died at Buffalo, March 8, 1874.

**Film**. A flexible material used in photography in place of glass plates as the support of the sensitive emulsion in the making of negatives. The advantages of film are reduction of weight and the facility of loading the camera and developing the negatives without a dark room, and non-liability of the negatives to breakage when stored. Celluloid was formerly almost exclusively used as flexible support, but has now been largely replaced by an acetate base which is non-inflammable. Paper is employed in some recording instruments such as oscillographs and cardiographs. The sensitive film is generally used as a long band backed with a longer band of black paper, wound together as a spool or bobbin. The extra length of paper at each end allows of the spool's being inserted in one chamber of a film camera, and then of the film's being wound on to a second but empty spool after exposure. Owing to the enveloping black

paper both operations can be done in full daylight, and material for any number of photographic subjects can thus be carried and used without a dark room. In the miniature film cameras using 35-mm. perforated film, the paper backing is dispensed with, the film being loaded into a light-tight cassette which is inserted in the camera from which it passes into a similar holder or is rewound into the original cassette before removal from the camera. A limited use of unbacked film is also made in other sizes of specially designed cameras. The so-called "daylight loading" of film cameras was introduced commercially in 1891 by the Eastman Kodak Co. for the Eastman roll-film introduced in 1889. Emulsion-coated film of stiffer substance is also used in cut pieces, and is handled in the same way as dry plates.

**FILM PACK**. This is a carton of cut films placed one behind the

other, each with a protruding paper tab attached and so arranged that by drawing out the appropriate tab the film which has been exposed is drawn round to the back, leaving the next film in position for exposure. The film pack is a daylight loading device and is placed in the camera in a special adaptor which replaces the usual dark slide. A film strip is a strip of perforated film 35 mm. wide of the type marked as safety, carrying a series of photographic images adapted for optical but not for cinematographic projection. It is not bound between glass or other protective medium. The usual size of each frame is 36 mm. long by 24 mm. wide. The film strip has largely replaced sets of lantern slides for educative and instructional purposes. A film strip projector is an optical lantern, automatic or semi-automatic in action, specially designed for the projection of film strips.

## FILM: A 20TH-CENTURY ART FORM

*This article examines the varied types of entertainment and information which moving pictures provide. For the scientific, technical, historical, administrative, and legal aspects of the industry, see Cinematography*

In the cinematograph trade the word film is generally used in the U.K. not only for the photographic film itself but for the sequence of pictures as projected from that film on the screen, being thus analogous with a play or a novel, and therefore suitable for consideration as a work of art. The corresponding American term is motion picture or "movie."

The earliest cinematograph films, in the late 1890s, were content with the wonder of recording mere incidents of movement of the "train coming into a station" kind. These simple experiments were the historical basis of a highly developed art, the later additions of sound and colour having only enlarged the scope of the same art, the essence of which is to awaken particular impressions and responses by the creation of an illusion of reality within its own conventions, the chief means of illusion still being movement.

The simplest form is seen in the news film, which was originated as early as 1896 with a film of the Derby shown in London on the evening of Derby day. Most cinemas include in their programme a series of brief topical films, a spoken commentary usually supplementing such sounds as were actually recorded with the taking of the pictures. The items

filmed are almost always pre-arranged public events and sporting occasions. Only rarely is a film camera fortunate enough to pick up an unexpected item of news, though this has sometimes happened either through intelligent anticipation or through luck, as in the filming of the 1913 Derby when a camera at Tattenham Corner recorded the tragic incident of Emily Davison throwing herself in front of the King's horse, or when the screen was able to show clearly that a goal in the 1932 F.A. Cup final was kicked from the wrong side of the line.

Closely allied to the news films are the topical feature films, including fashion displays and personal interviews, and the so-called "travel" films, which are in effect conducted tours in unfamiliar parts of the world. The latter were first popularised during the opening decade of the 20th century by such enterprises as Hale's Tours of the World. Travel films, like nature films, form a considerable proportion of those designed primarily for educational purposes, which also include those which illustrate by the aid of animated diagrams various branches of science.

A variation of the informative feature film is seen in the American series, *The March of Time*, which,

beginning in 1935, led the way in the judicious selection of factual camera shots to give point and purpose to a single topical theme. A more considered exploiting of this device is presented by the "documentary" films, as developed by John Grierson and other British directors. These records of life and industry are based on factual material but aim at an imaginative interpretation of the subject. They can focus on high lights and striking contrasts, and may reveal an underlying rhythm to which the music and spoken commentary of the sound track give emphasis.

#### Tricks and Devices

In a class by themselves are what were once known as trick films, using to the full the camera's power of illusion in startling or amusing ways, e.g. by double exposure, backward projection, ultra-slow or ultra-rapid exposure. Though the trick film as such has become a rarity, its devices have been fully employed in other types of films, from the "slow-motion" informative film revealing the full grace of athletic movement and the "rapid motion" educational film (e.g. showing the growth of flowers) to the use of illusory effects in fantastic films like *The Invisible Man*, *Blithe Spirit*, or *A Matter of Life and Death*. Very early films of this type were made by a French director, Melies, e.g. *A Trip to the Moon* (1902). Other often-used devices, or tricks, include the superimposing of background scenery, the use of small scale models, and the "doubling" of a star actor's part for the more violent kind of incident; also such methods of switching from one scene to another as the "fade," the "dissolve," and the "wipe," terms which explain themselves.

The trick film was also the parent of the animated cartoon, which brings drawings to life. Cartoons date from 1908, when Cohl made his *Phantasmagoria*. Their popularity was ensured with the invention of Pat Sullivan's *Felix the Cat* in 1917. Since the coming of sound the foremost place in this field has been held by Walt Disney, first with Mickey Mouse, then with the Silly Symphonies which first introduced an unexpected note of beauty into the film cartoon, and finally with such ambitious full-length cartoons as *Snow White* and the *Seven Dwarfs* and its successors, each necessitating over 20,000 separate drawings.

But by far the majority of films made are dramatic narratives (or photoplays, as they are called in the U.S.A.) enacted by professional actors from specially prepared scripts with a background, as often as not, of specially made scenery; and subsequently collated and given continuity and shape by expert "cutters." The primary purpose of such films is to entertain. Sometimes the stories are new; sometimes they are adapted from existing novels and plays. The source of origin of a film story does not in itself appear to affect either its box-office success or its worth as a work of art.

For better or worse, the general standards of film story, as well as those of acting and technical accomplishment, were set by the U.S.A., which obtained virtually a world monopoly in film production during the First Great War, and maintained its commanding commercial position for many years, Hollywood becoming the world centre of the film industry. For too long the general artistic level remained low. The box-office came first, and the average Hollywood silent film, designed to appeal to the uneducated masses throughout the world, was based either on sentimental romance, equivalent to that found in cheap novelettes, or on crude sensationalism. Humour, having a universal appeal, received a better showing, especially as an artistic genius in Charles Chaplin was found to show the way. But of wit, of intellectual content, of intelligent appreciation of human problems, or of insight into any but the most superficial human emotions, there was almost nothing. Technical achievement was immense, artistic achievement negligible.

#### European Developments

European countries approached the new art more seriously. The U.F.A. productions of Germany during the 1920s were in advance of their time, and their experiments in reflecting the researches of the psycho-analysts, as seen in such films as *The Cabinet of Dr. Caligari* (1919), attracted attention no less than their bold experiments in novel photographic "angles," unusual lighting, and atmospheric suggestion. Later German films, e.g. *Mädchen in Uniform*, *Westfront*, *Emil and the Detectives*, *The Captain of Kopenick*, were revolutionary in their delineation of character, their development of dramatic tension,

their accuracy in psychology. The experiments were abruptly ended in 1933 with the seizure of power by the Nazis.

France evolved a highly individual style of film drama, distinguished by a spritely and mordant wit, seen at its best in the early films of René Clair, e.g. *Sous les Toits de Paris* (1930) and *Le Million* (1931), but echoed in such later films as *La Kermesse Héroïque* (1936), *Un Carnet de Bal* (1937), *La Femme du Boulanger* (1939), and *Les Enfants du Paradis*, which was made during the German occupation. These memorable German and French films were made at trifling cost compared with the huge sums expended by Hollywood; nor were they great commercial successes.

#### Where British Films Excel

For some years after 1918 British film drama was mainly content with imitating the conventions of Hollywood. Such directors as Alfred Hitchcock, Anthony Asquith, and Alexander Korda were the first to establish artistic standards which were more satisfactorily indigenous, and by 1939 British films were ready to challenge comparison at least in quality with Hollywood products, whatever they lacked in quantity. A particularly happy vein was discovered in historical and biographical subjects, demanding a blending of accuracy in factual detail with imaginative treatment of character. A good example of this was Korda's *The Private Life of Henry VIII* (1934). Another British characteristic that has lent itself to successful treatment in British films is an affection for the authentic recording of familiar scenes and objects of daily life in and around the homes of ordinary people. British directors have been able to discover the stuff of appealing film drama in buses, trains, bicycles, motor coaches, suburban shops, village inns, factory canteens, humble breakfast tables, back yards, air raid shelters, and even, as in *Hue and Cry* (1947), the bombed ruins of London. One need search for examples no farther back than *Millions Like Us* (1943), *Tawny Pipit* (1944), *Waterloo Road* (1944), and *Brief Encounter* (1946). In place of the Hollywood formula of stock figures in startling surroundings, many of the best British films have offered all the rich oddities of native character against a background that is deliberately humdrum. The great heritage of English literature and

English drama, from Shakespeare to Shaw, provides another field for the British film which, in spite of isolated successes, has scarcely begun to be tapped.

That the Hollywood standards have slowly improved, however, becomes obvious if the list of awards of the American Academy of Motion Pictures, Arts and Sciences, is studied from its inception in 1927. The list includes *All Quiet on the Western Front* (1930), *Cimarron* (1931), *Mutiny on the Bounty* (1935), *The Life of Émile Zola* (1937), *Gone With the Wind* (1939), and *Casablanca* (1943), all films of considerable artistic achievement. To this list might be added *Mr. Deeds Goes to Town* (1936), *Green Pastures* (1936), *Louis Pasteur* (1936), *The Good Earth* (1937), *Citizen Kaffé* (1941), *The Best Years of Our Lives* (1947), and *Johnny Belinda* (1949). Moreover, from the coming of sound films and the consequent elimination of mere miming, American film actors, in spite of intense "off-stage" publicity, quickly schooled themselves to a natural style of acting which took British actors a whole decade to emulate. Hollywood's pre-eminence in the making of elaborate musical films remains unchallenged. So do the American comic films; there have been no British equivalents of the Marx Brothers, Laurel and Hardy, or Abbott and Costello.

#### Comparisons with the Stage

Compared with the stage, the film has proved itself to be unlimited in its range of subject. It can annihilate time and space, can portray a man's innermost thoughts, show a thousand actors at once or reveal the almost imperceptible twitch of an eyelid. With equal ease it enables the spectator to follow a procession through the streets of modern London or across the deserts of ancient Egypt. From the camera the spectator borrows an all-seeing eye; and among other things that eye cannot fail to catch many glimpses of beauty. The all-seeing eye moves rapidly. Shakespeare's *Romeo and Juliet* is divided into 22 scenes. Thalberg's film version had over 260, many of them no more than momentary. There were 239 separate camera scenes in *The Private Life of Henry VIII*.

The life of a film is short but intense, for it can be seen simultaneously in every part of the world. In Great Britain its life usually consists of a preliminary run at one or two cinemas in the

west end of London, followed immediately by a general and almost simultaneous release to the suburbs and provinces, where it is seen for no more than one week, and seldom again. After this it is assumed that everybody who wishes to see it has done so. A few cinemas specialise in the re-showing of earlier favourites, but general revivals are reserved for only an infinitesimal proportion of films. The British Film Institute (*v.i.*) compiles a valuable library of films as they are discarded by the trade, but their work began too late to save many of great historic interest.

#### Social and Moral Influences

This powerful art form has been made the medium for information, education, commercial advertising, propaganda (especially in the U.S.S.R., which nationalised its film industry in 1919), and, above all, entertainment. The extent of its social and moral influence has been debated from the very outset, ever since the exhibition in 1896 of a film called *The Kiss*. Much has been heard of the harmful influences of "the pictures": it is in the nature of things that any beneficial influences should remain unstated and incalculable. The moral effect of watching gangsters at work may well be balanced by that of watching policemen at work. Voluntary censorship on both sides of the Atlantic protects the public from certain excesses. For the rest, all that can be said with certainty is that the film-going habit has become deeply ingrained among many millions of the world's inhabitants, and that any improvement in the artistic standards of the commercial film is a sure reflection of improvement in public taste and public demand. See *Censorship*.

#### Gordon Stowell

**Bibliography.** *The Romance of the Movies*, L. Wood, 1937; *America at the Movies*, M. Thorp, 1939; *Documentary Film*, P. Rotha, 1939; *The Film Answers Back*, E. W. and M. M. Robson, 1939; *Design for Moving Pictures*, E. Carrick, 1941; *Movie Cavalcade*, F. M. Speed, 1941; *The Film Sense*, S. Eisenstein, trans. J. Leyda, 1943; *Film*, R. Maxwell, 1944.

**Film Censors, BRITISH BOARD OF.** Organization established by the British film industry to formulate and administer a code of voluntary censorship of films produced or exhibited in Great Britain. The first president, G. A. Redford, was succeeded in turn by T. P. O'Connor, Edward Shortt, Lord Tyrrell of Avon, and Sir

Sidney Harris. The board has no legal power to enforce its code, but an exhibitor who offends may have subsequent supplies of films withheld, while a producer who offends may be refused facilities for exhibiting. A film banned by the board is not necessarily excluded from public exhibition: a local authority may decide that it may be exhibited. Also there is no control over films exhibited by private film societies.

The policy of the board is designed to safeguard morals, eschew politics, and to avoid the cruel or vicious in life. Films are not passed for exhibition if they include scenes depicting cruelty to animals; nor are films which might offend religious susceptibilities. Until May 10, 1941, when the building was destroyed, the headquarters of the board was at Carlisle House, Soho, built by Wren in 1670. See *Censorship: Hays Office*.

**Filmer, SIR ROBERT** (d. 1653). English political writer. Educated at Trinity College, Cambridge, he was a staunch royalist, and suffered much during the Civil War. His political treatises, mostly published posthumously, are of an absolutist character, defending the patriarchal theory of the origin of government, and attacking the doctrines of Hobbes, Milton, and others. The most important is *Patriarcha*, published 1680 and to which Locke replied in his *Treatise on Government*. Filmer died May 26, 1653.

**Film Institute, THE BRITISH.** Organization set up in 1933 to collect information, promote cooperation between teachers and the film industry, advise govt. depts. and schools on production and use of films, encourage research, and maintain a national film library. It receives an annual grant, at first derived from the Sunday cinematograph fund, later direct from the treasury, and has a board of governors representing govt. depts., educational bodies, and bodies connected with the film industry. As a result of a committee of enquiry under Sir Cyril Radcliffe, 1947-48, it was required to concentrate on encouraging the development of the art of the film, promote new uses for the film, and support other bodies with similar objects; and the governors were appointed by the lord president of the council. Its h.q. is at 164, Shaftesbury Avenue, London, W.1.

**Filmy Fern.** Ferns of delicate texture belonging to the genera *Trichomanes* and *Hymenophyllum*.

The leaves are so thin in substance that they are more or less pellucid, and lose moisture so rapidly that they are found growing only where the atmosphere is humid. Consequently in cultivation they require to be kept in a closed case. The filmy ferns proper form the genus *Hymenophyllum*, of which *H.*



Filmy Fern. Leaves of *Hymenophyllum tunbridgense*

*tunbridgense* is a well-known European form, with leaves only two or three inches long, growing in matted sheets on moist, shaded rock. The Killarney fern (*Trichomanes radicans*) is larger, with leaves as much as a foot long.

**Filon**, PIERRE MARIE AUGUSTIN (1841-1916). French author. The second son of the historian, Charles Auguste Filon (1800-75), in 1867 he was appointed tutor to the Prince Imperial, only son of Napoleon III, and after the Franco-Prussian War he accompanied the prince to England. He died at Croydon, May 13, 1916. Besides numerous studies of English life and literature contributed to French reviews, his voluminous works include *Guy Patin, Sa Vie et Sa Correspondance*, 1862; *Histoire de la Littérature Anglaise*, crowned by the Academy, 1883; *Nos Grand-Pères*, 1887; *Prosper Mérimée*, 1898; *De Dumas à Rostand*, 1898; and *La Caricature en Angleterre*, 1902. His son Louis (1875-1937) became a leading English mathematician.

**Filter.** Device for removing suspended matter from fluid. When matter is removed from a fluid by passing through a medium having holes smaller than the particles, for instance through wire gauze or perforated metal, the medium is a strainer rather than a filter. A filter proper may have holes very much larger than the particles removed, separation being effected by the trapping of the particles in the angles, narrow channels, and corners of the mass of the filtering body. In general, the greater the

thickness of the filter, the finer the filtration; a large thickness of a coarse body has the same effect as a smaller depth of a finer body; e.g. a layer 3 ft. deep of fine sand is equivalent to a layer one-eighth of an inch thick of fine kieselguhr.

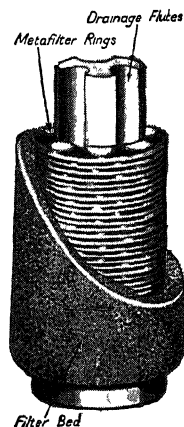
A filter may take the form either of a sheet or of a mass of granular material held in a container. The commonest materials used as sheet filters are paper, cloth, porous stone, asbestos sheet, and sintered materials. Typical loose materials used as filters are sand, carbonate of lime, paper-pulp, powdered charcoal, kieselguhr, asbestos.

**SAND FILTERS.** Used mainly for the filtration of water, these are of three types: (1) slow sand filter, which is a layer of sand 2-3 ft. thick above a layer of gravel 1-2 ft. thick, covering often many acres. Water percolates through under gravity and is then pumped away. A rate of 1 to 2 gallons per sq. ft. per hour is usual; (2) rapid sand filter—a layer of sand in a large concrete open tank, used mainly for the preliminary purification of water from mud; it gives only a moderate degree of filtration; (3) pressure sand filter: in this, hydrate of aluminium is generally used in conjunction with the filter bed, which is enclosed in a cylindrical tank into which the water is pumped under pressure; a flow of 100 gallons per sq. ft. of filter surface per hour normally is attained. The filtering medium is fairly fine sand, and the pressure used does not in general exceed 20 lb. per sq. in. This type of filter is suitable for swimming baths and industrial installations.

**CLOTH FILTERS** can be classified under the following headings: (1) filter press (*q.v.*); (2) rotary filter, the usual type of which is a horizontal drum divided into separate sector compartments, the curved surface being covered with filter cloth. The filter is mounted to rotate on its longitudinal axis half submerged in the liquid to be filtered. As each section becomes submerged a valve puts it into communication with a vacuum pump which draws the liquid through the cloth surface, leaving the solid to form a cake on the outside. When in the course of the rotation the section emerges from the liquid the suction is continued to dry the cake, and sometimes wash water is applied at this point. Before the drum completes a revolution, the cake is scraped off by a stationary knife, or blown off, or otherwise removed, and the cloth surface thus cleaned is ready

for another cycle; (3) bag filter: this usually consists of a number of bags, each about 6 ft. long and 9 ins. in diameter, their necks tied each to a short pipe by which liquid enters the interior of the bag from a tray supplied with the liquid to be filtered. Each pipe fits tightly into a hole in the bottom of the tray. This filter is effective in removing slimy deposits where high pressures are inadmissible; (4) gravity filter, which consists of cloth bags with a drainage frame inside them. Several are supported in a closed tank to which liquid is supplied under a pressure of 10 to 20 ft. gravity head. The liquid flows through the cloth into the centre of the bag and a nipple provides an outlet through a liquid-tight joint to the outside of the tank, where the filtrate is collected in a gully.

There is a very large variety of filters using finely porous material such as unglazed porcelain, compressed asbestos, compacted kieselguhr, or edge-filtration through paper. The "Metafilter" (Fig. 1), suited to fine clarifications of many different types, is a combination

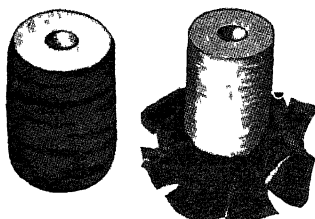


Filter. Fig. 1. Metal edge filter which uses the spaces between a number of metal rings as the filtering medium

a metal edge-filter (in which the filtering surface is made up of the edges of a large number of rings spaced accurately a few thousandths of an inch apart) with a fine filter bed, such as powdered carbon or kieselguhr, forming a layer over it and firmly supported by the metal substructure. The actual filtering is carried out by the bed; the porosity and chemical or physical nature of this can be varied to eliminate bacteria or remove precipitates, to withstand chemical attack or temperatures from below 0°C. up to red heat.

The "Streamline" filter was developed from a discovery made during the study of streamline flow, when it was found that paper joints separating sheets of glass between which the shape of streamlines was being studied had the effect of permitting flow past their edges and at the same time removing

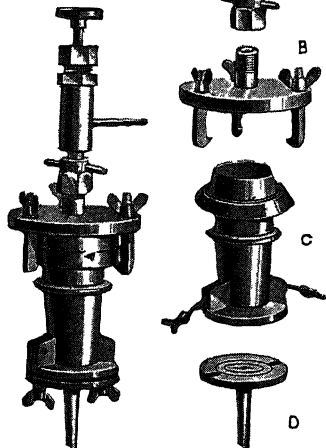
extremely finely divided material. This discovery gave a filter in which many sheets of suitable paper were superimposed with their edges all in line to form a filtering surface. In the filter shown in



Filter. Fig. 2. Paper pack (left) and filter body (right) for edge filter.

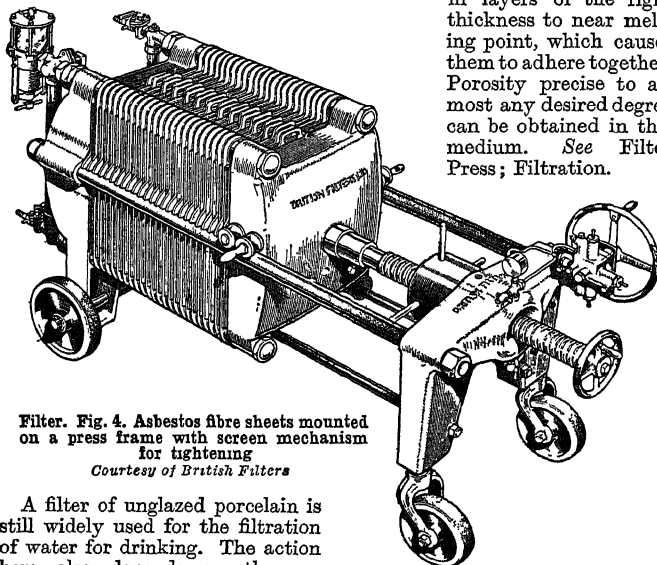
Fig. 2, the paper rings composing it are about two inches in diameter with a half-inch diameter hole, forming a drainage pipe in the middle. The pack is mounted in a filter body, and liquid forced through from the outside to the central hole, by pressure or by suction. The solids collect on the outside. This type of filter is fine enough to remove colloidal particles.

In the "Ultrafilter" (Fig. 3), the filtering medium is a film of excessively fine porosity, often produced by treating a surface with a solution of nitro-cellulose and precipitating the cellulose by immersion in water. The resulting translucent



Filter. Fig. 3. "Ultrafilter" which can be used for pressures up to 12 atmospheres with about one sq. in. of filter surface. Funnel (D) carries the filtering membrane on the perforated plate and is clamped by wing nuts to cone (C) containing liquid. Cover (B) is tightened and pressure applied through regulating valve (A). Left. Filter assembled

film is covered with tiny pores, small enough to prevent the passage of colloidal particles down to one hundred-thousandth of a millimetre. The "Ultrafilter" works by straining and is consequently very easily cleaned by backflushing; but the technique of its use is difficult, as the film is excessively delicate and the filter usually has to be operated under very high pressure. Construction of a large size "Ultrafilter" is scarcely practicable.



Filter. Fig. 4. Asbestos fibre sheets mounted on a press frame with screen mechanism for tightening  
Courtesy of British Filters

A filter of unglazed porcelain is still widely used for the filtration of water for drinking. The action here also depends on the extremely fine pore size of the material. The pores, although larger than those of the "Ultrafilter," will remove bacteria, but not viruses.

The filter is usually a hollow cylinder with a spigot outlet projecting through the bottom of a container. It is easy to use, but difficult to clean on the outside and impossible to clean on the inside. A similar filter is made from kieselguhr lightly cemented and pressed into solid form; this removes bacteria and filters quicker than a porcelain filter; it is even more fragile.

A widely used type of filter is made of sheets of compressed asbestos fibre, sometimes of varying degrees of porosity but with a closeness of structure sufficient to remove bacteria and spores. The

sheets are mounted in a specially constructed press (Fig. 4), built closely on the lines of a filter press. Though the asbestos sheets, which are expensive, can be cleaned to some extent by washing, it is generally found that they have to be discarded rather frequently.

The sintered glass filter (Figs. 5 and 6) is popular for laboratory use. Glass particles are first classified by sieving within suitable dimension limits, and then heated in layers of the right thickness to near melting point, which causes them to adhere together. Porosity precise to almost any desired degree can be obtained in this medium. See Filter Press; Filtration.

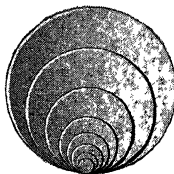
**Filter Press.** Device for separating solids from liquids by filtration under pressure. The earliest filter presses consisted of frames

supporting filter cloths placed side by side or piled upon one another and held together in a screw press. This structure is still the basis of a filter press; but pressure is now applied to the liquid to force it through the assembly, and it is this pressure,

rather than that holding the plates together, which is in mind when the filter press is referred to.

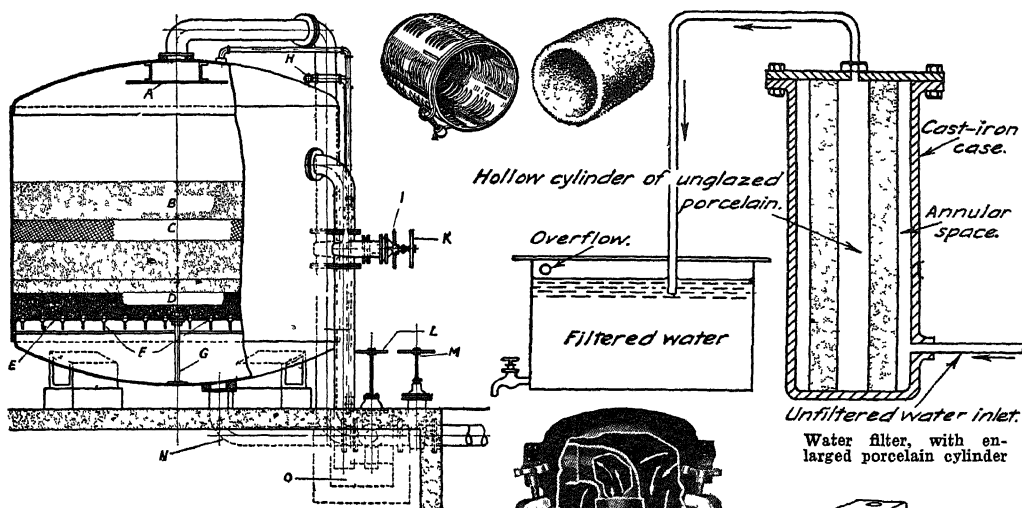
There are two main types of filter press: (1) for removal and collection of precipitates from liquids, the usual filter press; (2) for the expression of liquids from solids, often called an extraction press.

Filter presses proper can be subdivided into (a) the recessed plate type filter and (b) the flush plate



Filter. Fig. 5 (left). Sintered glass discs which can be used in ordinary funnels. Fig. 6 (right). Funnel of Buchner type with the sintered glass septum fused in

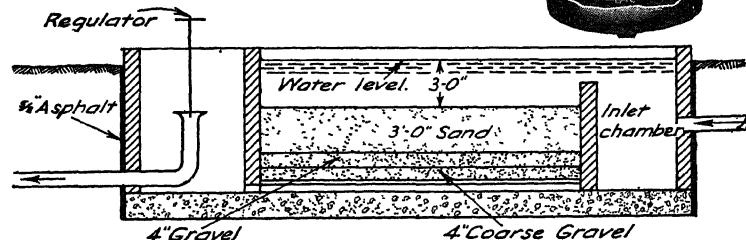




**Filter.** Types used for air and water. Above: polarite pressure filter; A, spreader plate; B, sand bed; C, layer of polarite; D, graded gravel; E, nozzle plate; F, nozzles; G, stay rod; H, air main; I, unfiltered water inlet valve; K, washwater outlet valve; L, drain valve; M, filtered water outlet valve; N, filtered water outlet pipe; O, washwater drain sump. Top centre, air filter for motor car engine, felt cylinder at right. Below, small sand filter shown in section  
Candy Filter Co. Ltd.

Water filter, with enlarged porcelain cylinder

Petrol filter for motor car engine. Above left, air filter for vacuum pump to prevent ingress of abrasive material  
Dollinger Corporation, N.Y.



and distance frame filter. Both types when in operation consist of a series of chambers having walls covered with filter cloth, provided with drainage channels which lead down to filtrate outlets (see Fig. 1, p. 3338). The filtering frames covered with cloth are mounted vertically so as to face each other and slide on the side members of the press frame and are tightened by the operation of the screw mechanism. The liquid enters the press at the far end and emerges from both frames through the filtrate cocks shown at the sides, the filtered liquid being collected by the trough.

The internal construction of a recessed plate filter is shown in Fig. 2 (p. 3338), of a section through the closing head and the first chamber. This press has centre feed. A, A1, and A2 are filter plates forming chambers

B, B1, and B2, into which the material to be filtered enters by means of inlet D. The outlets for the filtrate connect to the ports marked E. The rims C of the plates are machined so that when the plates are tightened into position, the cloth makes tight joints between the plates. Each chamber is thus completely lined with cloth so that, when the material to be filtered is forced in under pressure, the solid particles are retained by the cloth, and the liquid portion, freed from suspended matter, passes through to the outlet.

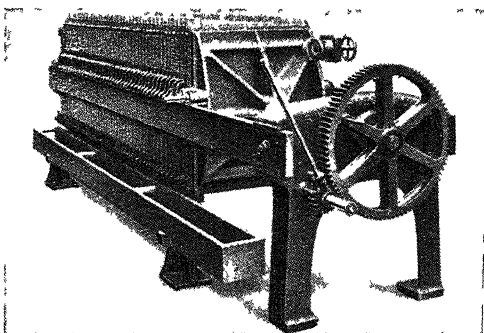
A filter with flush plate and distance frames is shown in Fig. 3 (p. 3338): F are the filter plates and D the distance frames which form the chambers. A is the inlet passage for the material, having ports B connecting it to the interior of the chambers. C are

ports connecting to the outlets for the filtrate which may terminate in cocks or run into a common closed delivery passage. The plates have faced joint surfaces flush with the filtering surface, the chambers being formed by hollow frames with plane surfaces corresponding with those of the plates between them. The cloths are hung over the plates so that each chamber has a cloth on both sides.

Filter presses are convenient where moderate proportions of solids, say up to 10 p.c., have to be removed from the liquids. They are used until the space within is filled with solids, which can be washed out, without taking down the filter, by passing water through it.

Filter presses require rather more labour than some other types of filter, but are almost indispensable for many operations,





Filter Press. Fig. 1. Cloth filter frames mounted vertically and compressed by an operating screw; trough for collecting filtered liquid is seen at left

particularly in chemical manufacture, in which steam heated models are sometimes used. They are usually constructed of cast iron, but can be made in almost any metal. Their surfaces are protected from attack by many different coatings. Cloths are also made in many different qualities and grades to suit different needs.

Extraction presses are used chiefly in the separation of oil from nuts and seeds. Before the material is put into the press, it is prepared, usually by grinding and heating. The Anglo-American or plate type of press, which produced flat rectangular residue cakes, was rather laborious in use: it consisted of a large number of frames or trays, piled one on top of another, each of which had to be packed separately with extraction material. Pressure applied to the whole pile expressed most of the oil, but some remained in the margins of the cake, and these had to be trimmed off and re-pressed.

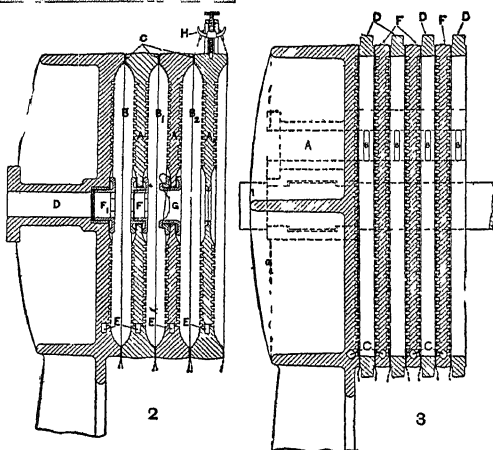
The continuous automatic oil expeller tends to displace the plate press. Prepared meal is placed in the cooker above the expeller (see Fig. 4). Steam valves closely control the temperature and moisture content of the meal, which is fed through an adjustable valve to the expeller-pressing cages. Here the cooked meal is subjected to heavy pressure by means of specially shaped and pitched worms, and is propelled through the cage in a continuous column and finally discharged at the cage end past an adjustable

choking device which determines the final pressure applied. The expressed oil leaves the cage through bars which form the cage lining, set at five-thousandths to fifteen-thousandths of an inch apart, depending on the material. The expelled cake is in

water, without danger of disease, filtration is essential.

Two general types of filter are in use: (1) the slow sand filter (*v.s.*), first used in Great Britain early in the 19th century. It depends substantially on biological activity for its efficiency, and is controlled largely by climatic conditions; (2) the rapid or mechanical sand filter, developed during the 20th century. This has greater flexibility and is more amenable to control.

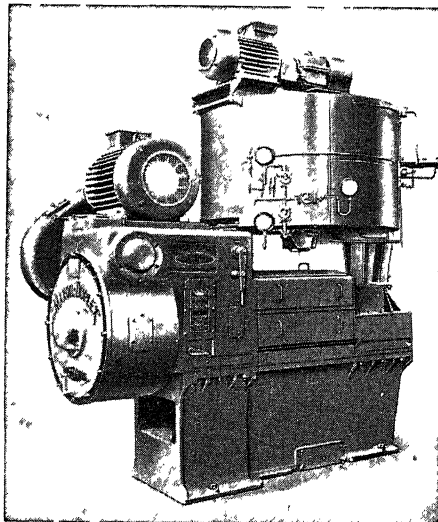
Slow sand filters are now seldom constructed except as additions to existing plant. They consist of rectangular brickwork or concrete basins, on the bottom of which are channels, perforated pipes, or other under-drains supporting gravel on which rests a bed of sand. The under-drain system must be so designed that its frictional resistance when the filter is operating does not exceed 25 p.c. of the frictional loss occurring in the sand when it is clean. During operation the water depth over the sand is generally 4 ft. when the sand is at full depth, which should be 2 to 3 ft. above 1 to 2 ft. of gravel. The sand should be hard, durable grains, free from impurities such as clay, iron, sulphates, phosphates, and organic



Filter Press. Fig. 2. A, filter plates; B, chambers between plates; C, rims of plates; D, unfiltered liquid inlet; E, filtered liquid outlet ports; F, screwed unions, holding cloths at centre; G, instantaneous clip for holding cloth; H, adjustable hook to hold up cloth. Fig. 3: A, inlet passage for unfiltered liquid; B, ports admitting filtered liquid to chambers; C, ports admitting filtrate to outlet passage; D, distance frames; F, filter plates

thin flakes of irregular shape up to  $\frac{3}{8}$  in. thick, and is quite hard when cold.

**Filtration.** Process of removing fine solids from liquids. The two uses of the process of most interest to the general public are in the purification of water supplies and of sewage. Most waters require treatment either for the removal of disease germs and unpleasant taste and odour, or for the elimination of gases, murkiness, and colour. Methods of treatment are storage and simple sedimentation; rapid sedimentation with chemicals as coagulants, followed by filtration. To produce a clear, sparkling



Filter Press. Fig. 4. Continuous extraction press for the expressing of oil from oil seeds. This type of press has the advantage of continuous productivity as against batch pressing

matter, and should be carefully graded. Rate of flow through the bed, which is downwards, is usually between 2 and 6 inches an hour, equivalent to from 1.1 to 3.3 million galls. per acre per day, at which rate it is reasonable to expect that 98 to 99 p.c. of the bacteria have been removed. The greater part of the purification of the water is effected in the top few inches of the bed, which is cleansed by scraping off the top layer and exposing a fresh surface of sand. The sand removed can be washed and replaced. It is not advisable to

reduce the sand bed by more than a foot before replacement. After cleaning, the beds are refilled with filtered water from below until the sand is completely covered, thus preventing the entrapping of air in the sand.

Rapid filters are of two types, the open gravity filter and the closed pressure filter. The essential characteristics are (1) careful pre-treatment of the water; (2) high rate of filtration, the speed varying from 60 to 150 galls. per sq. ft. per hr. according to the character of the water to be filtered (100 galls. per sq. ft. per hr. is equivalent to approximately 105 million galls. per acre per day, and this rate is in fairly general use); (3) washing the filter units by a reverse flow of filtered water upward to remove impurities which have lodged in the sand.

The filters are built in units which are constructed usually of concrete for the open gravity type, and of steel cylinders for the closed pressure type. They contain a bed of sand resting on gravel, with suitable water distributing arrangements at the top and under-drainage system at the bottom. In some filters, compressed air is admitted as part of the back-washing process, and in others the sand bed is agitated mechanically during washing. The sand



Filtration. Slow sand filter-bed at a Metropolitan Water Board's London works. Workmen are seen shovelling the sand-bed into heaps before the process of washing and relaying of the sand, preparatory to a new fill-up of water

used should be free from dirt, hard and resistant, and preferably of quartz or quartzite. It should not contain more than 2 p.c. of lime and magnesia calculated as carbonates. The effective size specified is between 0.44 mm. and 0.6 mm. and the uniformity coefficient not more than 1.7. The depth of the sand bed should be  $2\frac{1}{2}$  to 3 ft., of the supporting layer of graded gravel 1 to  $1\frac{1}{2}$  ft., and of the water above the sand 3 to 4 ft. The sand removes bacteria, finely divided clay, and colloidal matter even smaller than the sand grains, and this is accounted for by the fact that the minute void spaces act as small sedimentation chambers, permitting the suspended particles to come in contact with the sand surfaces which soon become sticky, particularly if small amounts of floc come into the bed from the coagulation process. There is soon accumulated in the top few inches of the sand various suspended matters which form a dense blanket of mud, floc, and living or dead organisms, which is called *schmutzdecke*, or dirty skin. It is possible, also, that removal of colloidal matter is brought about by sand particles which have an opposite electrical charge to the ions of the colloids, the grains attracting colloidal matter until their charges are neutral-

ised. The accumulated material is removed by washing, and the sand's electrical charge is restored.

Rapid filters are considered the more desirable in ordinary circumstances, although there is a field for the slow filter where the water is very clear and requires preliminary treatment for a limited time only. The over-all bacterial efficiencies of the two types are the same. The slow filter requires less skill in operation; generally costs less to operate; uses less wash-water. The rapid filter will clear more turbid water; is more efficient in colour control; has greater flexibility in operation because it involves chemical pre-treatment; involves less interruption of service during cleaning; is lower in first cost, taking into account the cost of land. (*Consult Examination of Waters and Water Supplies*, E. V. Suckling, 5th ed., 1943.)

SEWAGE. Biological filtration, used at the majority of sewage disposal works in Great Britain, developed from earlier systems in which sewage was allowed to percolate downwards through porous soil, the liquid then being drained away through agricultural drains laid at a distance of 3 or 4 ft. from the surface. The sewage is first passed through screens and detritus channels to remove coarse suspended solids and grit and is

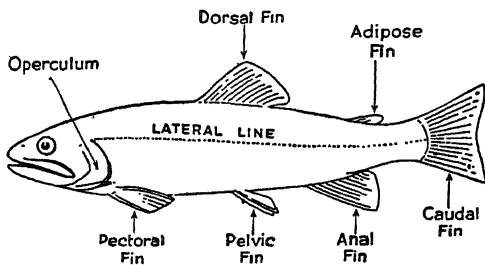
treated in sedimentation tanks in which a large proportion of the fine and colloidal suspended matter is removed. Supernatant liquid from these sedimentation tanks is treated in percolating filters.

A percolating filter is designed to purify the settled sewage rapidly by biological action. It comprises (1) a concrete base sloping to the centre or to the periphery in such a way that the filtered sewage easily runs away to collecting channels; (2) a system of underdrains resting on the base and designed for rapid and easy removal of the filtered liquid; (3) a wall to retain the filtering medium; (4) a bed of filtering medium; (5) a distributor through which the settled sewage is supplied evenly over the surface of the filter.

#### The Filtering Medium

The filtering medium should be well graded; the size of the pieces differs for different purposes, but is commonly from 1 in. to 2 ins. The chief requirements of the filtering medium are that it should be durable and chemically inert. Material used on a large scale includes water-worn gravel, broken stone, metallurgical coke, slag, and clinker. In Great Britain the depth of filtering medium is commonly 6 ft. It is very important that there should be a free current of air through the bed of medium, and for this reason ventilating holes are provided at the bottom of the retaining wall to induce an upward draught of air through the filter. The even distribution of settled sewage over the surface of the filtering medium is usually achieved by passing it through fixed sprays, or through rotary distributors (for circular filters), or through distributors moving backwards and forwards (for rectangular filters).

It is usual to start new filters by applying settled sewage at a low rate, the dose being gradually increased as the pieces of medium become coated with the biological film of material from the sewage containing bacteria and, especially at the surface, fungi, and providing food for numerous other organisms which live in the spaces between the pieces of medium. The most important types are springtails, worms, and the larvae of certain flies. These "scouring" organisms play an important part in restricting the excessive growth of biological film which might otherwise choke the filter. Adult flies, however, emerging from percolating filters sometimes cause a nuisance, and it may be necessary



Fin. Diagram of the outline of a fish showing the positions of its various fins

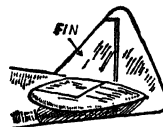
to treat a filter with insecticide to reduce the number of fly larvae.

Settled sewage contains colloidal organic matter which it is impossible to remove by further sedimentation. Effluent from a percolating filter contains coarse suspended matter ("humus") consisting partly of pieces of biological film broken away by the action of the scouring organisms. This humus can fairly readily be removed by sedimentation in humus tanks. Settled sewage may have a biochemical oxygen demand of 25 parts per 100,000; it usually contains no nitrite or nitrate, but may contain perhaps 5 parts per 100,000 of nitrogen in the form of ammonia. A settled filter effluent should have a biochemical oxygen demand not exceeding 2 parts per 100,000, and most of the ammonia should have been oxidised by biological action to nitrate.

The permissible rate of filtration of settled sewage to yield an effluent of good quality depends on the strength of the sewage, but for a liquid of average strength is usually of the order of 60 to 90 gallons per cubic yard of filtering medium per day. If the permissible rate is exceeded the growth of biological film in the filter may increase to such an extent as to cause first "ponding" on the surface of the medium, and finally complete blockage of the filter. At the same time the quality of the final effluent would usually deteriorate. Advances in the technique of biological filtration, however, have made it possible under favourable conditions to increase considerably the rate of treatment of the settled sewage. Current systems of filtration include (a) treatment in covered filters with forced circulation of air from the top downwards, (b) filtration of settled sewage mixed with settled effluent pumped back from the humus tanks and mixed with the settled sewage before application to the filter, and (c) alternating

usually of centrally placed dorsal, anal, and caudal fins.

**Fin.** In aeronautics, any fixed subsidiary vertical plane or surface usually at the rear part of the fuselage of an aircraft. The fin is generally mounted in front of the rudder, and its purpose is to increase the stability of the machine. A cooling rib of metal formed on the cylinder of an engine is also termed a fin. Its purpose is to facilitate the radiation of heat from the engine and prevent overheating. Fins are fitted to paravanes (*q.v.*) to ensure their remaining at a constant depth when submerged, and largestabilising fins are fitted to the rear of



Fin of an aeroplane

some racing cars to keep them on a level course when travelling at high speed. See Aeroplane.

**Finale** (Ital., *end*). Closing movement of a composition of extended character, such as a sonata, symphony, or concerto; or the last portion of one of the acts of an opera, in which as a rule a large number of the performers assemble on the stage. The operatic finale often consists of several distinct movements, but all leading up to the final ensemble. As the coda is the concluding section of a single movement, so the finale winds up a complete work consisting of several movements. During the past two centuries the coda and finale, from being mere perfunctory endings of little significance, have become an important summing up and climax.

**Finance** (late Lat. *finare*, to pay a fine). A word used for money matters in general, but especially for those of a country, town, or other corporate body. See Consols; National Debt; National Finance.

**Finance Act.** Name given to the annual Act of Parliament that legalises the proposals contained in the budget (*q.v.*).

**Fin** (Lat. *penna*, wing, fin). Expansion of the skin or body wall in aquatic animals, by means of which they swim. In the fishes fins are of two kinds, paired and unpaired. The former correspond to the limbs in the higher animals; the latter con-

**Financial Times**, THE. London newspaper, founded in 1888, published daily at twopence. It reports all financial matters, company meetings, and stock exchange dealings, making careful industrial and economic surveys and studies of trade prospects. From time to time illustrated supplements are included in the ordinary issue, dealing with trade conditions in foreign countries. In 1924 the *Financial Times* absorbed the *Financier* and *Bullionist*, an amalgamation of two journals begun respectively in 1870 and 1866. In 1945 it was merged with the *Financial News* (founded 1884), though its title was retained. It has the largest circulation of any financial paper in the British Empire. Its printing works are at St. Clements Press, and its head office at 72, Coleman Street, E.C.2.

**Finch**. Name applied to a large family of small birds, Fringillidae, distributed over most of the temperate zone, except Australasia. They are characterised by hard conical beaks, and have nine primary wing feathers and twelve feathers in the tail. The nostrils are close together, and there are a few short bristles around the mouth. In most species the sexes are differently coloured or marked. Finches are in the main seed-eaters; they are commonly found in small companies, and they frequent both woods and open country. Among the commoner finches in Great Britain are hawfinch, greenfinch, chaffinch, brambling, goldfinch, siskin, linnet. See Brambling illus.

**Finch, JOHN FINCH, BARON** (1584-1660). English politician, born Sept. 17, 1584. Elected Speaker of the house of commons in 1628, he figured in a scene when he was held down in his chair during Sir John Eliot's remonstrance against tonnage and poundage. Chief justice of the common pleas in 1634, he presided at Hampden's trial for refusal to pay ship money. A zealous servant of the crown, Finch was made lord keeper and a peer in 1640, but was later impeached and spent years in exile during the Civil War and Commonwealth. He died Nov. 27, 1660, in England. *Consult* Life and Times, W. H. Terry, 1936.

**Finchley**. Residential bor. and parl. div. of Middlesex, England. Lying E. of Hendon, N. of Golders Green, Hampstead, and Highgate, and S. of Whetstone and Barnet, it is approached from St. John's Wood by the Finchley Road, from Highgate by the Great North

Road; these roads converge at Tally Ho corner (N. Finchley). The bor. is served by London Transport. It contains Church End, and part of Hampstead garden suburb. Near the Perpendicular parish church of St. Mary, restored in 1872, is Christ College, founded 1857. About 90 acres of what was Finchley Common, once a resort of highwaymen and the scene of several military encampments, are occupied by the Islington and St. Pancras cemeteries; St. Marylebone cemetery is between East Finchley and Church End. General Monk mustered his forces here in 1660, and the Guards were assembled here in 1745, an event commemorated in Hogarth's picture, *The March to Finchley*. Finchley joins the urban district of Friern Barnet to return one member to parliament. Pop. est. 66,000.

**Finck, HERMAN** (1872-1939). British conductor and composer. Born in London, Nov. 4, 1872, he studied at the Guildhall School of Music, was musical director of the Palace Theatre, London, 1900-21, and at Drury Lane, 1922-31. He composed music for many musical comedies and revues, as well as hundreds of songs and light pieces, of which the most popular was *In the Shadows*. He also specialised in attractive arrangements of popular airs, his *Melodious Memories* (over 70 tunes in 15 minutes) being a masterpiece of its kind and giving its name to his autobiography, published 1936. He died April 21, 1939.

**Findhorn**. River of the counties of Elgin, Nairn, and Inverness, Scotland. It issues from the Monadhliath Mts., and flows N.E. for 62 m. to Moray Firth, which it enters 2 m. N. of Forres through Findhorn Bay. Findhorn, a fishing village and watering-place, is on the E. shore of the bay.

**Findlay**. City of Ohio, U.S.A., the co. seat of Hancock co. On the Blanchard river, 44 m. by rly. S.S.W. of Toledo, it is served by several rlys. and an airport. Findlay is situated in an agricultural, oil, and natural gas region. Agricultural products include livestock, poultry, grain, and sugar beet; manufactured articles, lorry bodies, motor car parts, tires, cigars, gloves, brick, stone, and lime. Laid out in 1821, it was incorporated in 1838, and chartered as a city in 1890. Pop. 20,228.

**Findlay, SIR JOHN GEORGE** (1862-1929). New Zealand statesman. He was born at Dunedin,

Oct. 21, 1862, and went to Otago university. After being prominent as a lawyer he became attorney-general, minister of justice, and colonial secretary. In 1911, with Sir J. Ward, he represented New Zealand at the Imperial Conference. Ever a strong advocate of Imperial federation, he made a special study of the problems of Imperial policy in the Pacific. He died Dec. 7, 1929.

**Findon**. Village of Kincardineshire, Scotland. It is on the coast, 6 m. S. of Aberdeen. Fishing is carried on, and the village gives its name to the Findon or Fionn had-docks, which were first cured here.

**Fine** (Lat. *finis*, the end). Term common in English law. Originally it was a sum of money imposed upon someone by way of compounding, i.e. paying to make an end of the matter instead of going to prison or paying in several instalments. By feudal law a leaseholder often pays a fine for the renewal of his lease. The word is most often applied to a sum of money imposed as a penalty for a criminal offence or breach of some law or regulation. The maximum is usually fixed by a statute, the exact amount being decided by the court; but during the Second Great War fines unlimited in amount could be imposed on companies for breaches of Defence Regulations.

**Fine Arts**. Term comprehensively embracing all the five greater arts which minister to the love of the beautiful, the intellectual, and the tasteful, viz.: music, poetry, painting, sculpture, and architecture. Custom, however, has confined the term to the last three particularly, and these again include allied subjects, such as engraving, decoration and design. The French term *Beaux Arts* has a similar significance.

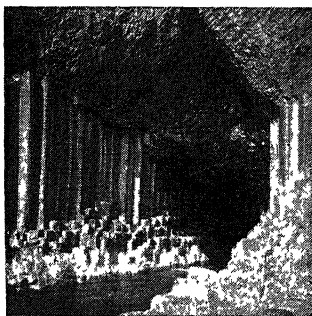
**Fine Gael**. Name of the Irish political party—meaning "stock of the Gael"—formed of the remnants of the Cosgrave (*q.v.*) pro-treaty party in Dáil Éireann which was in power in the Irish Free State from 1922. In 1932 it was heavily defeated by Eamon De Valera's Fianna Fáil (*q.v.*), becoming the opposition party for 16 years. At the 1948 elections Fine Gael secured 31 seats and was again the chief opposition party. Combining with other parties to outvote Fianna Fáil, Fine Gael supplied in J. A. Costello a leader for a coalition govt.

**Fines and Recoveries**. Legal fiction introduced in England to override an Act of Parliament

which was against the public interest. By the statute *De Donis Conditionalibus* (on conditional gifts) in 1285, it was enacted, in effect, that land which was entailed could never be disentailed; so that if an estate were given or left to A in tail, it must always keep in A's family and could never be sold. By this, among other things, the creditors of A, or his heir in tail, could never touch the land for their debts. The judges were strongly opposed to the policy of the barons who had passed this Act, because they thought it against the public interest that land should be made inalienable.

Therefore from about 1400 they connived at fines and recoveries, which were fictitious actions worked thus. A is the holder in tail of Whiteacre. He wishes to disentail, so that he can sell or mortgage, or divide his land amongst his family. An action is brought by X, claiming the land from A, X alleging that the land was his in fee simple (*q.v.*). A, on getting into court, says that the land was granted to him by Q, who was in fact, the usher of the court; Q was then called upon to come into court and defend his title. Of course Q put in no appearance. Judgement was thus given in favour of X; and X, having recovered the land as a fee simple, promptly reconveyed it to A as a fee simple, free from the entail. By an Act of 1833 fines and recoveries were abolished. See Fiction, Legal.

**Fingal's Cave.** Cavern in the island of Staffa, Scotland, the most notable of its kind. Hollowed out of the basalt, the grotto is 228 ft. long, 48 ft. wide, and 60 ft. high. It is remarkable for its regular basaltic columns, for its wonderful and varying colours revealed as the light plays upon it, and for its stalactites. On the S. of the island, it was discovered by Sir Joseph Banks in 1772. Sea birds live in the



Fingal's Cave, Staffa. The pillared entrance to the grotto

cave, which is also noted for the sound made at times by the wind rushing out of it. In Gaelic speech it is called the cave of music. Mendelssohn's overture, op. 26, alternatively called *The Hebrides* or *Fingal's Cave*—composed 1829—is regarded as one of the finest portrayals of the sea in music.

**Finger.** Terminal member of the hand. The bones or phalanges of the fingers are three in number



Finger. Bones of human fingers

in each finger, except the thumb, which has only two. The fingers articulate with the metacarpal bones of the palm. Along the backs of the fingers pass the tendons of the extensor muscles, which straighten the fingers, and along the fronts the tendons of the flexor muscles, which close the hand. The blood supply of each finger is derived from two digital arteries which run along each side of the finger and unite at its extremity. The nerves which supply the skin are derived from the ulnar, radial, and median nerves.

The digits are named pollex, or thumb, index, medius, annularis, and minimus.

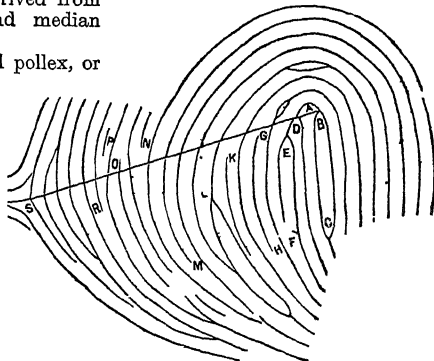
**Supernumerary** fingers are not uncommon. In a case on record there were twelve fingers on one hand and thirteen on the other, and twelve toes on each foot. Absence of one or more fingers, or part of a finger, may also be a congenital deformity, *i.e.* present at birth. In webbing of the fingers, or syndactylism, a thin web, usually consisting chiefly of skin, unites one or more fingers. Sometimes the union is thick and fleshy. See Anatomy.

**Finger and Toe.** Disease causing malformation of the roots of turnips and other cruciferous crops also known as club-root (*q.v.*).

**Fingerboard.** Portion of a stringed instrument against which the fingers press the strings in order to regulate the vibrating lengths of the strings, and so control the pitch of the sounds. Bowed

instruments of the violin family have smooth fingerboards on which the player must judge and remember the correct stopping-places; the plucked instruments such as the guitar, mandoline, and banjo usually have frets or cross ridges to assist the player.

**Finger Print.** Impression of the human finger. It is used to classify human beings; but chiefly for the identification of persons who have passed through the hands of the police. The individuality of finger prints and their value in proving identity were known to the Chinese about 200 B.C., and an impression of the thumb was used in lieu of signature; but it was not till the 19th century that the classification of the ridges on the finger tips was attempted.



**Finger Print.** Two diagrams illustrating (upper) the actual thumb print in blood left by a murderer, and (lower) the lines of the ridges of this thumb print drawn to facilitate examination. The letters from A to S indicate the various characteristics which distinguish the print, *e.g.* L is the bifurcated ridge, S B is the line joining the two terminal points of the print, to enable the number of ridges to be counted and compared with a known thumb print of the murderer, who was caught and sentenced on the evidence furnished by these two diagrams

In 1823, Purkenje, professor of physiology at Breslau, suggested a system of classification, and in 1858 Sir William Herschel laid the foundations of the present system in Bengal. In 1890 Sir Francis Galton pointed out that ridges on the fingers of a new-born infant were absolutely identical to the day of death.

The full value of Purkenje's, Herschel's, and Galton's work was recognized when Sir Edward Henry devised a numerical formula for classifying the impressions. The Henry system has been widely adopted by the police organizations of the world. Under the American Seaman's Law of 1915 the finger prints of every sailor in the American merchant marine were taken for classification of able seamen, etc., and the prevention of fraud; while in the war department finger print records are kept of every soldier. It has been shown that the chance of identity of two finger prints is less than one in sixty-four thousand millions, and the prints of one finger, therefore, are enough to decide the question of identity. If, as is customary, the prints of three or more fingers are taken possibility of error is eliminated.

All finger print impressions are divided into two groups of four types and eight distinct patterns, such as loops, arches, etc. The ten fingers in the Henry system are divided into five pairs, and by a special way of numbering these pairs the classification of a particular finger print is made simple. See Criminology.

**Fingo** OR AMAFENGU (Zulu, wanderers). Collective name for Bantu-speaking peoples of Kaffir stock whose tribal unity was destroyed by the Zulus under Chaka. In 1835 the Cape government gave them asylum near the Great Fish river; this Fingoland reserve became, in 1877, one of the Transkei districts. Always friendly to the British, they have become largely Europeanised and Christianised, with a high educational standard. They furnish labour contingents for the harbours and mines.

**Finial** (Lat. *finis*, end). In architecture, a foliated ornament capping a pinnacle, gable, or stair-post. Occasionally the finials of stair-posts themselves acted as supports for statuary, like those at Cromwell House, Highgate, where they are surrounded by Roundhead figures.



Finial. Example from Canterbury Cathedral

**Finiguerra**, MASO (c. 1426-64). Italian goldsmith and engraver, born probably at Florence. Details of his life are uncertain. He was trained as a goldsmith in the workshop of the Pollaiuoli. He is stated by Vasari to have invented engraving on metal, but he was only one

of the pioneers in this craft, which he practised together with niello work, of which he was a master. Intarsias by him are to be seen in the sacristy and the cathedral museum, Florence; his prints and drawings are in the Uffizi gallery and the British Museum. There has been much controversy as to his alleged invention of engraving.

**Fining** (Lat. *finis*, end). Process by which liquids are freed of solid matter and impurities, and thus clarified. Though somewhat akin to filtering, it is used in a special sense in the brewing and distilling industries, various substances such as isinglass, sulphate of lime, etc., being employed to collect and carry off the matter in solution, leaving the liquid bright and clear. In fining syrups white of egg may be used, the albumen being dissolved by heat. Wines are similarly fined without the application of heat, the alcohol acting as the solvent. (See Brewing; Distilling.) Fining is also a process in glass-making, and was used in the production of malleable iron before puddling was introduced.

**Finistère**. Dept. of France. In the extreme N.W. of the country and part of Brittany, it is bordered by the sea on three sides. The Aulne is the most important river. The

coast is rocky and broken, but contains some good harbours. Off it are Ushant and other islands. The dept. is hilly, though not mountainous, and much of the land is covered by forest and heath, useless for growing crops. Elsewhere, however, especially in the south, there is fertile land which produces asparagus, onions, and other vegetables, as well as apples and fruit. Oats and wheat are grown; cattle and horses are reared, while the peasants also keep bees and make butter. Many of the inhabitants are employed in the fisheries. The dept. has five arrondissements. Quimper, liberated by the F.F.I. Aug. 9, 1944, is the capital town, but Brest, centre of a fierce battle, Aug.-Sept., is the most important. Morlaix is also a flourishing port. With the surrender of the Germans in Brest, Sept. 19, 1944, the whole department was liberated. Area, 2,729 sq. m. Pop. 724,735.

**Finisterre**. Cape on the N.W. extremity of Spain, in the prov. of Corunna. Off the cape two naval actions were fought in 1747 between the British and French, resulting in the defeat of the latter. Admiral Anson commanded the British forces on May 3, and Admiral Hawke on Oct. 14.

## FINLAND: LAND OF FOREST AND LAKE

*The history and social organization of the Finns, a small, progressive, energetic, and independent-minded people, and a description of the geography of their lake-studded country are given here, together with a brief account of the two wars they fought with Russia between 1939 and 1944. See also in N.V.*

Finland, a republic of N. Europe, lies between Russia on the E., Sweden and the Gulf of Bothnia on the W., Norway on the N., and the Gulf of Finland on the S. Its greatest length is 717 miles, its average breadth about 185. In area it is rather smaller than Great Britain and Ireland. Helsinki (pop., 1943: 327,627) is the capital.

Finland's coast-line, which is entirely on the Baltic, is 1,000 m. long, low-lying, highly indented and fringed with islands of which the Aaland Is. (q.v.) in the S.W. are the most important. The country consists of a great plateau, at an elevation of 400 to 600 ft., with lowlands round the coast. The surface of the land consists of hard and crystalline rock, granite, etc., for the most part covered with a thin layer of infertile sands and clay. Drainage is bad and the soil is water-logged during most of the year. The southern half of the plateau has about 25 p.c. of its area occupied by thou-

sands of shallow lakes, many of them linked by short natural and artificial channels. In the N. the plateau is more elevated and rugged, rising in many places to heights of over 2,000 ft., but there are no well-defined mountain ranges. The northern part of the country is Lapland and is inhabited by the nomad race of Lapps.

Marsh and bog have occupied about 30 p.c. of the country, but the bog area is being diminished by the united efforts of nature and man. About 12 p.c. is covered by lakes, of which there are more than 60,000. In the S., 120 large lakes and several thousand small ones, all connected and having a natural outlet into Lake Ladoga, spread over an area 502 sq. m. Lake Ladoga, once partly in Finland, but now wholly within



Finland arms



Russia, is adjacent to the Imatra falls (or rather rapids) which for scenery are the finest of their kind in Europe and in volume of water the greatest. There are numerous short rivers broken by rapids and navigable only in stretches, but useful for floating timber. Many of them are well supplied with fish, but are more important as a source of water-power—often severely curtailed by frost in winter and drought in summer.

#### Forests and Animals

Finland is relatively the most wooded country in Europe, more than half the land surface being under forest. Two-fifths of these woods are owned by the state, the rest privately. A law of 1917 prohibits the reckless felling of timber by private individuals. Scots pine and Norway spruce are the most widespread of the trees and the most profitable; after them come birch, alder, ash, and oak. Among wild animals are bear, fox, lynx, ermine, otter, elk, and hare. The wild reindeer and beaver, formerly abundant, are now extinct. There are over 200 species of birds, not counting the domestic sorts. Seals

are plentiful along the coast and in Lakes Saima and Ladoga. In the rivers, lakes, and seas of Finland there are some 70 species of fish, the most abundant being a kind of herring off the S. and S.W. coasts. It forms an important element in the food of all classes; large quantities, both smoked and salted, are stored for winter. Most of the rivers yield salmon, trout, perch, or pike.

The climate, owing to the prevalence of moist W. and S.W. winds, is less severe than it is farther east in corresponding latitudes. In Jan. the average monthly temperature varies from 90° F. about Lake Enare to 30° along the S. coast; while in July the difference between the monthly averages is only 8°, being 53° in the N. and 61° in the S.E. Everywhere, and especially in the interior, the winter lasts a long time. The summer is short, occasionally very hot in June and July, when the mosquitoes can be a plague. But the long summer days, with the sun only for an hour or two under the horizon, have a peculiar charm.

The dominion of the Swedes was very unfavourable to anything like a Finnish literature, the writers of Finland preferring to write in Swedish and so secure a wider audience. It was not until 1835 that the Kalevala appeared, an epic poem formed by E. Lönnrot (1802-1884) out of a collection of popular songs taken down from the lips of the peasantry as they from time immemorial had heard them from their *runolainen* or singers. An idea of the form and metre of the Kalevala can be obtained from Longfellow's *Hiawatha*, which is an imitation of it. The Kalevala has been translated into many languages and has been favourably compared with the Iliad.

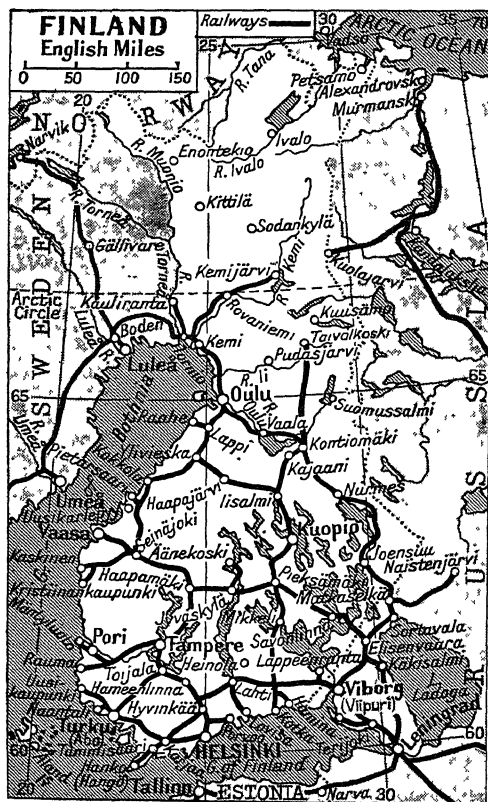
#### Later Finnish Writers

By far the most brilliant of the Finns who wrote in Swedish was J. L. Runeberg (*q.v.*), 1804-77. During the last years of the 19th century there was an ever-increasing literary activity in Finnish, the publication of books in Swedish becoming relatively less. Finland is wonderfully rich in periodicals of all kinds, the publications of the Finnish societies of literature and the sciences and other learned bodies being especially valuable. In imaginative literature there have been several important writers in Finnish, such as Alexis Stenwall ("Kivi"), 1834-72, the son of a village tailor, who was the best poet of his time. The Seven Brothers, an historical romance, is a particular favourite, and he wrote various popular dramas.

The language is Finnish; but Swedish is understood in the larger towns and is the language of the Åland Islands. It was formerly the official as well as the literary language. The earliest writer in the Finnish vernacular was Michael Agricola (1506-1557), who was bishop of Åbo (now Turku). He published an ABC book in 1544 and a number of religious and educational works. A complete Bible in Finnish was published in Stockholm in 1642.

The only figure of world-wide fame in the arts produced by Finland is Sibelius (*q.v.*)

**HISTORY.** The Finns reached Finland from their Asiatic home in the 7th and 8th centuries; they found people already living there of whom the present-day Lapps are probably the descendants. In the 12th century



Finland. Map of this North European republic, once part of the Russian Empire

Sweden sought to introduce Christianity into Finland, but an obstinate struggle with paganism followed, lasting nearly 150 years. One of the leaders of the first Swedish christianising expedition, Henrik, bishop of Uppsala, an Englishman by birth, later, as Henrik the martyr, became Finland's patron saint. Gradually Swedish influence spread round the coasts and for 600 years Finland formed part of the kingdom of Sweden, enjoying, however, a large measure of self-government. From the beginning of the 17th century the Finns had their own diet, the electoral basis of which remained virtually unchanged until 1906; the system then adopted has survived with a few modifications to the present day. The legal system of the Finnish republic is still based on the *Codex Gustavianus*, maintained over several centuries under Swedish kings, Russian tsars, during the civil war, and since the establishment of an independent Finland.

#### Finland a Theatre of War

Early in the 18th century, Finland became the theatre of bloody struggles between Russians and Swedes. By the treaty of Nystad (1721) Russia secured the province of Viborg (Viipuri). Sweden unsuccessfully tried to recover the lost province in 1741, but the Russian sphere was extended. Finally, in 1809, Sweden withdrew from Finland, the whole of which, with the Åland Is., passed as a grand duchy to Russia, the grand duke being Tsar Alexander I. For many years the relations between Russia and Finland were cordial, and Finland prospered, her autonomy being all but complete save in foreign affairs. Gradually, however, a Finnish national party arose, whose first object was to give Finnish the same standing as Swedish, the then official language of the country. This they succeeded in doing in 1863. In 1899 the Finnish constitution was suspended and Russian military government was established. The assassination of the Russian governor, the dictator, Gen Bobrikov, in 1904, and a general strike led to a temporary respite and in 1906 the constitution was restored. But in 1908 curtailment of Finnish rights began again; but many Finns managed to get through school without learning any Russian, although the teaching of it was compulsory; and in 1914, out of 391 newspapers and periodicals published in Finland,

274 were in Finnish, 103 in Swedish, 7 in Swedish and Finnish, 3 in Russian, 2 in German, 1 in English, and 1 in French.

When, at the outbreak of the First Great War, Russia's coercive measures increased, the Finns, distrustful of Russia's allies, sympathised with the Germans. The Russian revolution of 1917 brought freedom to Finland, which declared itself in Dec. an indepen-

of parachute troops, and for the unexpectedly good defence put up by the Finns. But Finland was overpowered when the Russians, in Feb., 1940, broke the Mannerheim line, and by a treaty of peace concluded in Moscow and ratified by Finland in March operations ceased immediately. The terms included the cession to Russia of the whole of the Karelian Isthmus, the city of Viipuri, the whole

of Viipuri bay with its islands, territory N. and W. of Lake Ladoga, and a number of islands in the Gulf of Finland; both countries pledged themselves to non-aggression; Finland agreed to lease Hanko to Russia for 30 years, with the right to establish a military base there; a new railway was to be built jointly by the two countries to connect Russia and Sweden by a shorter route. The new frontier was approximately that agreed between Sweden and Russia in 1721. Finland lost the port of Viipuri, the defence works of the Mannerheim line, important sawmill, mining,



Finland. A typical Finnish peasant family

dent and sovereign state, and was recognized as such.

In 1920 Finland was admitted to the League of Nations and in the following year she was confirmed in possession of the Åland Is.

**RUSO-FINNISH WARS.** In Oct., 1939, the Finnish and Russian governments began unsuccessful negotiations over the Soviet demand for frontier readjustment and the right to establish air and naval bases on Finnish territory. Next month Russia denounced the Soviet-Finnish pact of non-aggression of 1932, announced the rupture of diplomatic relations, and stated that her only aim was to safeguard the security of the Soviet Union, and in particular of Leningrad (then only 25 m. inside the Russian frontier). Two days later the Russians attacked. A three months' war followed, chiefly remarkable for the use by the Russians for the first time in war

and water power resources, and factories.

When Germany attacked Russia in June, 1941, Finland joined her, and the Finns advanced to their old frontier, forming a constant threat to Leningrad. But the front here remained quiescent until the Russians launched an offensive early in 1944. Then, on June 10, the Russians attacked in the Karelian Isthmus, capturing Viipuri on the 20th. The U.S.A. broke off diplomatic relations with Finland, June 30, and negotiations began, leading to a treaty between the U.S.S.R. and the U.K. on the one hand, and Finland on the other, signed Sept. 19, by which the Finns undertook to disarm all German troops in Finland by Sept. 15, demilitarise the Åland Is., provide the Allies with airfields, return the oblast of Petsamo to the Soviet Union (the Soviet Union renouncing its

rights in the Hanko peninsula), pay an indemnity of 300 million dollars over six years, and restore, subject to certain changes, the terms of the treaty of March, 1940. A German army under Gen. Lothar Rendulic remained in N. Finland, but, cut off from the Gulf of Bothnia, was obliged to retreat through desolate country in the Arctic winter, pursued by the Russians, assisted more and more actively by the Finns as Rendulic left a trail of flaming villages behind him, until on Oct. 25 he crossed the Norwegian frontier, and Finland was freed from war.

**CONSTITUTION.** Finland has a single chamber, the diet or house of representatives, consisting of 200 members elected on a system of proportional representation by all men and women who have reached their 21st year. Women are eligible to sit. The president is elected for six years by an electoral college elected by the citizens. The council of state (ministry) is appointed by the president, but must have the support of the house of representatives. Education has been compulsory from seven to 15 since 1920; 9 p.c. only over 15 are illiterate. There are three universities, one at Helsinki and two (one Finnish, the other Swedish) at Turku. Secondary education is given in lyceums, high and middle schools, there are navigation, commercial, trade, technical, arts and crafts, agricultural, dairy, cattle management, horticultural, and forestry schools. More than 96 p.c. of the population belongs to the Lutheran religion. Among the rest are a few adherents of the Greek Catholic, the R.C., the Jewish, and the Mahomedan religions. Pop. in 1943 was 3,936,178, of whom 1,907,554 were males.

#### Life and Character of the People

The majority of the people are Finno-Ugric, belonging to the great Ural-Altaic family. Physically strong, hardy, and athletic, they have in general round faces, square shoulders, fair hair, and blue eyes. Their temperament is somewhat phlegmatic, and they are honest, hospitable, and clean. They have a keen sense of independence and personal freedom. Since 1920, prohibition of alcoholic liquors has been in force. They live simply and the food of the peasants is poor, but, except in the N. and E., there is little real poverty. The bath-house attached to every farm is characteristic of the country. The Swedish element of the popula-

tion is found in the towns and in the Aaland Is. The organization of public health is well developed.

**INDUSTRIES.** Essentially an agricultural country, with some 60 p.c. of the pop. engaged in this branch, mainly in small holdings of less than 25 acres, only about 3 p.c. of the country is under cultivation; about 5 p.c. is grassland. Oats, barley, rye, and potatoes are the chief crops. A little flax is grown. Numbers of dairy cattle are kept; also sheep, goats, and pigs, while Finnish horses have for long been noted for their speed, hardihood, and docility. Minerals are few and of small importance. Manufactures are well developed, mainly by the help of water power. They include engineering, machine making and shipbuilding, pulp and paper making, production of cotton goods, and tanning. Saw-mills number about 1,000. The chief port is Helsinki, after which come Turku, Kotka, and Oulu. The main exports are timber, butter, paper, pulp, and textiles, while the imports include cereals and other foods, cotton, machinery, and coal. Much of the inland traffic is by water, and so well linked by nature or by canals are the country's many lakes that it is among the countries of the world with the most adequate internal communications. The southern half of the country is well served by railways, of which in all there are some 3,500 m., all but about 150 m. state-owned. They are linked with those of Russia and Sweden.

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**FINLAND, GULF OF.** Eastern arm of the Baltic Sea, between Finland and Estonia S.S.R. Its length is 250 m. and its average breadth 60 m.; it is studded with islands. Several important towns are on the coast—Tallinn, Leningrad, Viipuri (Viborg), Helsinki. On one of the key islands in the Gulf of Finland is the Russian naval base of Kronstadt, which in the Second Great War played a part in the defence of Leningrad and resisted the attacks of German and Finnish forces.

In Oct., 1941, minefields were laid in the Gulf by the Germans and Finns; but Russian submarines and light craft continued to operate in these waters throughout the war, interrupting supply traffic along the coastal roads, sinking enemy shipping, and landing raiding parties behind the front line. When the Russians advanced through Estonia and Latvia in 1944, their warships based on Kronstadt sank many enemy transports in the Gulf and the Baltic Sea. Under the terms of the Russo-Finnish armistice of Sept., the U.S.S.R. acquired the right to establish a naval and air base in the area Porkkala-Udd, a peninsula about 30 m. S.W. of Helsinki. See Baltic Sea; Kronstadt.

**Finlay, ROBERT BANNATYNE FINLAY, 1ST VISCOUNT (1842-1929).** British lawyer, born July 11, 1842. He was educated at Edinburgh university, qualified as a doctor, was called to the bar in 1867, and sat in parliament, where he represented Inverness Burghs, 1885-92 and 1895-1906; Scottish universities, 1910-16. A strong Unionist, he became solicitor-general 1895-1900; attorney-general 1900-06. He was lord chancellor under Lloyd George, 1916-18. Made a viscount, he became British member of the permanent court of arbitration at The Hague in 1920 and the next year a member of the international court of justice. He died March 9, 1929, and was succeeded in the peerage by his son William. The latter, born 1875, became a judge of the high court in 1924 and a lord justice of appeal in 1938; he died June 30, 1945.

**Finlay, GEORGE (1799-1875).** British historian. Born at Faversham, Dec. 21, 1799, he was educated at the universities of Glasgow and Göttingen. He espoused the cause of Greek independence, saw much of Byron at Missolonghi, and finally made Greece his home, never visiting England after 1854. His great work, *A History of Greece from the Conquest by the Romans to the Present Time*, was published complete in 1877, its main parts having appeared in 1844, 1856, and 1861. He died in Athens, Jan. 26, 1875.

**Finmark OR FINNMARK.** Maritime fylker or county of N. Norway. It is bounded N. by the Arctic Ocean and S. by Lapland, and is the northernmost portion of the European land mass, culminating in the North Cape. Area, 18,580½ sq. m. Its rugged coast is indented by bays and fjords

fringed by numerous islands. The surface is elevated, rising to over 3,000 ft. in parts. The climate is severe, and life is hard. Fishing and reindeer breeding are the chief occupations. Hammerfest (*q.v.*) is the chief town. Pop. 53,308, mostly dwelling on or near the coast. Nomad Lapps occupy the interior.

In Oct., 1944, Russian forces pursued the German troops that had retreated from Finland into Finmark. Kirkenes was liberated on Oct. 25. As the Germans retreated, they forcibly removed the inhabitants, destroyed livestock, and burnt the towns of Kirkenes, Hammerfest, Vardö, and Vadsö as well as villages and even isolated farms, leaving the country almost lifeless. Reconstruction began immediately the Norwegian government took charge of the territory.

**Finn**, **FIONN**, **FIND**, OR **FINGAL**. Warrior hero of Celtic tradition. The legends which gather round his name have almost certainly a real historical figure behind them. Finn was the son of Cumhal (*pron. cool*) of Leinster, and was born after his father's death in battle at Cnucha; first called Demne, he came to be called Finn, the Fair One, from his appearance. He took over the leadership of the warrior band known as the Fians or Fianna from his life-long enemy Goll MacMorna. His sons Oisín and Fergus, his grandson Oscar, his herald Ullín, his favourite hound Bran, were famous figures in his story. One of the chief episodes in his career was the pursuit of Diarmid, who eloped with Grania, Finn's betrothed.

In Scottish legends Finn is known as Fingal, and was king of Morven, in Argyll. He was slain in the great defeat of the Fians at Gabra, probably in 283. His memory has never faded among the Gaelic peoples of Ireland and Scotland. See Gaelic Language and Literature; consult also Finn and His Companions, S. J. O'Grady, 1892; Gods and Fighting Men, Lady Gregory, 1910.

**Finnesburg**. THE FIGHT AT. Fragment of heroic Anglo-Saxon poetry, discovered in the binding of a MS. in Lambeth Palace library in the 16th century. It describes incidents of the battle between the Frisian chieftain Finn and the Danes. ~

**Finns**. A name denoting in general a people inhabiting central and northern Russia before the Slavonic dispersion. At first a medium-headed race of hunters and fishers, akin to the tall, blond, blue-eyed Nordic type, they min-

gled in the course of centuries with Alpine rather than Mongolian elements, and are now classifiable mainly by their dialects. These form, with the Ugrian, a branch of the Ural-Altaic family, out of which Aryan probably emerged. Numbering about 6,000,000, they are grouped as Volga, Permian (Votyak), and Baltic Finns. Of the last group the true Finns (Suomi), in Finland and contiguous territories, may exceed 3,000,000. These, having absorbed Swedish influences of race, culture, and speech, display a progressive civilization, a high intellectual attainment, and a passionate love of country. See Finland; Mordvin.

**Finsbury**. London metropolitan borough. Bounded S. by the City, it has the boroughs of Islington on the N., Shoreditch E., and Holborn and St. Pancras W. At one time a manor or lordship, forming one of the prebends of S. Paul's Cathedral, N. of Moorfields, and known as Fensbury, from the swampy nature of the ground, its old fields were practising grounds for military and archers, referred to by Shakespeare and Ben Jonson. Here, in 1548, Protector Somerset was met by the lord mayor on his return from Scotland. Finsbury was once a residential quarter for doctors and surgeons, and it includes Clerkenwell, a clock and watch-making centre. Within its area are Bunhill Fields, Northampton Institute, and St. John's Gate. Finsbury unites with Shoreditch to elect one M.P. Nineteenths of the houses suffered damage from air raids in the Second Great War; about a quarter of the rateable value was lost on Dec. 29-30, 1940. Pop. est. 34,500.

**Finsbury Park**. Recreation ground of N. London, the name of which is applied to the district immediately surrounding it, to an important main line rly. junction, and to a station on the Piccadilly line (for long its terminus). Just outside the county boundary, the park occupies 115 acres between the rly. and the N. continuation of Seven Sisters Road and Green Lanes. It was opened by the metropolitan board of works in

1869, the land costing £56,869 and the laying out about £50,000. It was planned to serve as a public park for the borough of Finsbury, which reached to its S. border.

**Finsen Light**. Form of treatment for lupus and other skin conditions, invented by the Danish scientist Niels Ryberg Finsen (1860-1904). The rays from a powerful electric arc lamp are passed into an absorbent medium which allows only the actinic or chemically active rays to pass through it. These rays, having been concentrated by means of lenses of rock crystal and cooled by being passed through a continuous current of cold water, are directed on to the affected area.

**Finsteraarhorn**. Mt. of Switzerland, between the cantons of Berne and Valais. It is the highest

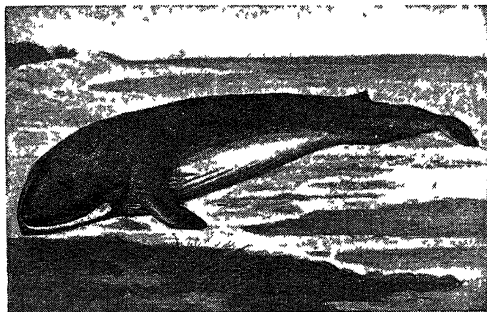


Finsteraarhorn, Switzerland, and the Aletsch glacier, seen from the air

peak of the Bernese Oberland (alt. 14,025 ft.), and extremely difficult of ascent. The summit was first reached in 1812. The Schreckhorn lies to the N. and the Jungfrau to the W.

**Fin-Whale** OR **FIN-BACK** (*Balaenoptera*). Name sometimes given to the rorqual, a common and widely distributed whale, of which five species are usually recognized. As their yield of blubber is small and their whalebone of inferior quality, they are not in great demand; this doubtless accounts for their being still found in great numbers in nearly every sea except near the Poles. They are of somewhat slender form, and have a short back fin, and narrow and pointed flippers. They have a large pouch in the throat for the reception of the fish on which they feed; and when this pouch is collapsed the skin of the throat lies in a number of longitudinal folds which are characteristic of the genus.

Of the four species included in the British fauna, the common



Fin-whale. Stranded specimen of rorqual, *Balaenoptera musculus*

rorqual (*B. physalus*) is often met with in the English and Irish Channels and cast up on the coasts. Sibbald's rorqual (*B. musculus*) is the largest of all whales, often exceeding 80 ft. in length. It is abundant in the North Sea, and occurs around the Hebrides. Rudolphi's rorqual (*B. borealis*), much smaller, has been found during recent years around E. and S.E. England. The lesser rorqual (*B. acutorostrum*) is about 30 ft. in length, and fairly common around all British coasts. Bryde's whale (*B. brydei*) is found off S. Africa. See Whale.

**Fiord** or **Fjord** (Scand.). Type of inlet found on the coasts of regions which have been greatly glaciated. During the ice age great glaciers scooped out deep trough-like valleys with precipitous sides, and the disappearance of the glaciers admitted the sea. A fiord is usually very deep except near the entrance, and sometimes subsidence of the land has added to its size. Fjords occur in British Columbia, Scotland, and Norway.

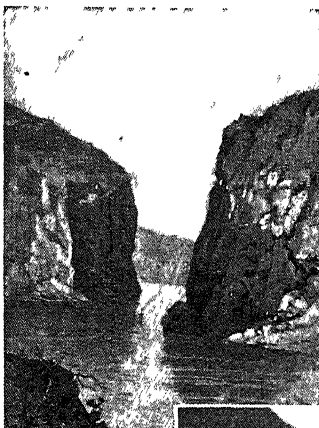
**Fir.** Cone-bearing trees of the family Coniferae, and genera *Abies*, *Picea*, and *Pinus*. Natives of Great Britain, N. Europe, N. America, Japan, and the Himalayas, their height varies from 10 to 200 ft. In gardens firs are best grown as specimen trees on lawns, where



Fir. Foliage of silver fir, *Abies pectinata*

silver fir. The genus *Picea* embraces the spruces, and *Pinus* the pines. Their cultivation in large quantities for timber is a branch of forestry (*q.v.*). See illus. p. 1325.

**Firbolg.** Legendary name of an early Irish race, usually said to mean bag-men. Some ethnologists employ it to denote the aboriginal



people, mainly composed of dark-haired, long-headed non-Aryan Iberians, who were subdued by the Milesians, a wave of Goidelic Celts that may have crossed from Great Britain. See Milesian.

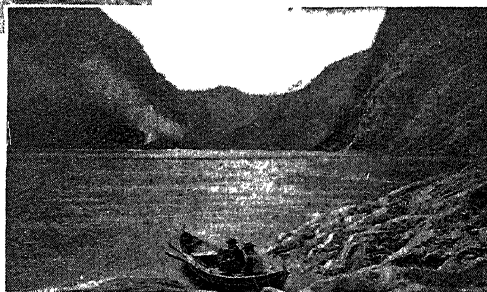
**Firdausí** or **Ferdusí** (c. 940-1020). Pen-name

of Abú'l Kásim Mansúr, Persian poet, called the Homer of the East. He was born at Schadab, near Tús, Khorassan, son of a small landowner. Carefully educated and an apt scholar, he is famous as the author of the *Sháh-Námeh*, or *Book of Kings*, a metrical history of Persia from early times to A.D. 641; and Yûsuf u Zulíkhâ, a poem

on Joseph and Potiphar's wife. The first-named work, in 60,000 couplets, was commissioned by Mahmúd, sultan of Ghazni, who promised 60,000 gold pieces as a reward. Firdausí, however, excited the enmity of Mahmúd's vizier, and when, at the end of his task, which occupied him for 30 years, the vizier sent him pieces of silver instead of gold, the indignant poet divided the money between the keeper of a bath, a sherbet seller, and the vizier's messenger, penned a flaming satire on Mahmúd, and, after spending the remainder of his life a proscribed man, died at Tús. According to legend, as his body was being borne to the grave, a messenger laden with 60,000 gold dinars from Mahmúd arrived, and, as Firdausí's daughter refused the money, it was spent on some much-needed public buildings in Tús.

The *Sháh-Námeh*, which has been described as the *Iliad* of Persia, is characterized by its Persian vocabulary, the simplicity of its style, its high qualities of invention, its original transcripts from nature, its patriotism, its dramatic dialogues, and its reflection of the author's Zoroastrian faith. Battles, combats, feasts, scenes of riot, and carnage alternate with pictures of innocence and peace. Much is taken up with the wars of Persians and Tartars, and one of the central characters is Rustum, the Persian Hercules, who unwittingly kills his own son, an episode familiar to modern readers in Matthew Arnold's poem, *Sohrab and Rustum*.

**Bibliography.** *Poems of F.*, Eng. trans. by J. Champion, 1785; *Sháh-Námeh*, trans. and abridged, J. Atkinson, 1832, new ed. 1892; Sooh-



Fiord. View in the Naero Fiord, Norway; above, typical cliff-walls of a fiord

rab, a free trans., J. Atkinson, 2nd ed. 1828; Episodes from the *Sháh-Námeh*, trans. into English verse, S. Weston, 1815; *Biographical Notices of Persian Poets*, Gore Ouseley, 1846; *Sháh-Námeh*, the orig. text, with French trans. in prose, J. Mohl, 1876-78; *The Epic of Kings*, H. Zimmern, 1886; *Literary History of Persia*, E. G. Browne, 1902-6; Yûsuf and Zulíkhâ, ed. H. Ethé, 1908.

**Fire.** Visible effect of the combustion of substances by means of the chemical combination of atmospheric oxygen with one or more of their constituents. The incombustible residue is called ash. Flame is formed when glowing gas is produced, either as a primary or as a secondary result of the burning. There may also be non-luminous vapours called smoke or fume.

The process of raising the temperature of combustible or inflammable substances to the point at which self-sustaining combustion proceeds is called ignition. This may be brought about by solar radiation, terrestrial heat, molecular action, electrical discharge, friction, pressure, or percussion. Fire may be extinguished before combustion is completed by reducing the temperature of the burning mass below the ignition point, or by stopping the access of air. In the domestic and industrial arts heat and light are commonly obtained from substances—solid, liquid, or gaseous—called fuels, mostly derived from carbonaceous materials of vegetable origin.

#### Early Theories of Combustion

Medieval alchemy pictured the world as composed of four elements: fire, water, earth, and air. When modern chemistry began, Boyle, while still holding fire to be a material element, discovered that air is essential to combustion. A theory propounded by Stahl, that combustible bodies contain a substance called phlogiston, which is released by their decomposition, was not exploded until Lavoisier, after discovering oxygen, explained burning as caused by the extraction of this gas from air and its combination with other substances.

The anthropological theory that early man was a fireless animal is supported by the fact that every primitive mythology has its own account of the origin of fire and of the discovery of its benefits by mankind; in general it is described as a gift of the gods. In Greek mythology, Prometheus brings down a torch lighted at the sun; according to the Vikings, Ukko struck a stone with iron and brought forth lightning; amongst the ancient Egyptians, Phoenicians, and Slavs, there existed fire-gods who personified the diverse functions of fire. The identity between life and fire was an elemental idea amongst the Romans, Persians, Hindus, and Red Indians. The gods of fire possessed variable qualities, *e.g.* the cruelty of Moloch and the beneficence of Hestia.

Traces of fire appear among human relics as far back as early Palaeolithic times. Except the Andaman Islanders, it is doubtful if any race or tribe has been completely without some knowledge of fire. Man's discovery of fire, and his ability to make and use it for his own benefit, marks the dividing line between animal and human existence. Perhaps in the form of burning lava from volcanoes, or from vegetation set on fire by lightning, fire was acquired and preserved for the most primitive use conceivable: for protection from beasts and for elementary cooking. The next stage was the invention of creating fire at will, either by friction of wood, as in the fire drill, saw, or plough, or by the percussion of minerals, as with flints and pyrites.

#### Communal Fires

With the necessity of preserving fire, man became sedentary and was obliged to live in groups; this gave rise to the social instinct, and to the use of fire for warming the person, cooking foods, hardening implements and utensils, and producing artificial light. Hence primitive man found it convenient always to have a fire burning in some protected place, which ultimately developed into a public building round which centred all religious, civil, and political activities. This principle of an ever-burning fire was observed by civilizations as diverse as the Egyptian, Greek, Roman, and Aztec. When the fire of Vesta at Rome went out, all business was suspended until it had been rekindled with appropriate ceremony. No Greek or Roman army would cross a frontier without carrying before it a fire lit from the sacred flame. Fire played a part in the ceremonies observed by ancient and primitive peoples during the initiation of boys into manhood. Most ancient and modern religious beliefs hold that the world will eventually be destroyed by fire.

Uncontrolled fire is the prime destructive agent of man's labours, and throughout history has destroyed more natural and built property than have all the wars combined. Despite the efficiency of modern fire-fighting and prevention methods, fire continues to take heavy toll of life and property; in Great Britain annual losses from fire total £13,000,000 and in the U.S.A. \$85,000,000. Vast tracts of valuable timber are annually lost in the forest fires of Canada and the U.S.A., while bush

fires in Australia, and even heath fires in the U.K., are responsible for much destruction. Most of these fires are caused by spontaneous combustion, but many are the result of carelessness. The wasteful method of clearing scrub land for cultivation by burning the bushes and trees destroys quantities of timber in India.

Sometimes property is fired maliciously, a felony punishable in England as arson and in Scotland as fire-raising. Much evil is wrought by thoughtless or unintentional incendiarism. Out of these perils have arisen the organized services concerned with fire precautions, proofing, prevention, extinction, and insurance.

Two of the most destructive fires of ancient times were those of Rome in A.D. 68, and Alexandria in the 7th century. The Great Fire (*q.v.*) of London in 1666 was one of the greatest conflagrations on record in time of peace. Other destructive fires were at Chicago, 1871; Boston, 1872; Baltimore, 1904; San Francisco, 1906; Yokohama and Tokyo, 1923; Wapping, London, 1935; Marseilles, 1938; Barbican, London, 1939.

The U.S.A., Canada, Australia, and New Zealand have been much more conscious of the dangers of fire, and more advanced in protective measures, than older nations. This is because in new countries buildings were invariably of wood. Many early towns in the New World still contain a high proportion of timber buildings, and in the event of large fires the damage is always serious.

#### Use in Offence and Defence

Like many inventions, fire was turned to warlike purposes soon after man adapted it to his use. In primitive tribal fighting, a prime object was to set alight the enemy's villages. This was achieved by flaming arrows, and, later, by the throwing of pots of incendiary chemicals, *e.g.* Greek fire. Fire later developed into a means of defence, either to delay an enemy's advance or to deny him the fruits of his victory; a notable example was the burning of Moscow by the Russians in 1812. During the Second Great War, the 'scorched earth' policy of the Russians and Germans in retreat hindered the enemy's advance. But fire did not become a controlled and accurate weapon before the development of the flame thrower and incendiary shell, bullet, and bomb in the First and Second Great Wars. (*See* Flame Weapons; Incendiary Weapons.)



It has frequently been used in simpler forms as a political weapon, notably by the Fenians, suffragettes, I.R.A., and I.W.W.

**Bibliography.** Evolution of Culture, A. H. L. Pitt-Rivers, new ed. 1906; The Northward Course of Empire, V. Stefansson, 1922; Man and Culture, Clark Wissler, 1923; Primitive Arts and Crafts, R. U. Sayce, 1933; The Science of Social Development, F. A. Brooke, 1936.

**Fire Alarm.** Mechanical device for making known the fact that a fire has broken out. Fire alarms are of two types, the manual and the automatic. The most common manual fire alarm is the street "break - the - glass - and - pull - the-knob" variety. These alarms are connected to a switchboard in the nearest fire station. When the alarm is pulled, a bell rings in the watch room of the station, and an indicator lights up on the board to show the position of the alarm from which the call comes.

Matter is expanded by heat, and this principle is used in all automatic fire alarms to actuate a mechanism which rings a bell outside the building in which a fire breaks out. The mercurial type consists of a thermometer with platinum wires entering the bulb and the top of the tube through fused joints. When the mercury rises to a certain height it completes the circuit of which the wires form part, and a bell rings. An adjustable form has the top of the tube open and a sliding upper wire.

Pneumatic alarms are operated by the expansion of air in a closed tube or vessel, and the pressing out of a diaphragm which brings a moving contact against a fixed contact. One variety has a bowl-shaped container with a concentrically corrugated top. The chamber is partly exhausted and then sealed. An alarm is given if the air inside be expanded by heat, or the chamber leaks and the vacuum is broken; in either event the diaphragm bulges outwards. In another variety air at atmospheric pressure is contained in a small chamber and in very fine tubes running from it round the walls of the apartments in which it is installed. The air in the tubes is heated quickly by a fire and communicates its pressure to the main chamber.

Metallic fire-alarm contacts employ two metals of unequal expansibility. A common form consists of a bar, compounded of a strip of steel and a strip of copper welded together, or otherwise

rigidly joined, fixed at one end and free to move at the other. When the bar is heated the copper expands more than the steel, and the bar curves towards the steel side, bringing the free end against a contact.

The May-Otway alarm has a horizontal steel bar several feet long, to the ends of which the extremities of a piece of copper wire are fastened. A contact-piece hangs from the centre of the wire. The bar and the wire form together a very obtuse-angled triangle. If the temperatures rise slowly—on a hot day, for example—the steel bar takes in heat as fast as the copper wire and their relative lengths are changed but slightly, whereas a sudden influx of heat affects the wire much more quickly than the bar, and the wire droops sufficiently to let its contact-piece touch a contact below.

Another automatic alarm has a glass bulb filled with liquid in which is trapped a bubble of gas. Increasing heat causes the liquid to expand and shatter the bulb, so releasing a valve, which has been held compressed by the pressure of the air in the bulb. Release of the valve closes an electrical circuit and rings a bell. The bubble of gas in the bulb before it is shattered prevents the alarm from functioning through changes in the weather. Most automatic alarms simultaneously bring into operation a system of chemical or water sprinklers designed to hold the fire in check until the arrival of the fire brigade. (See Fire Prevention.)

It is a criminal offence to give a false alarm of fire to a fire brigade, whether by a street fire alarm or by message. The maximum penalty is a fine of £25 in London and £20 elsewhere.

**Firearms.** Generic designation of weapons which throw a missile by virtue of the propellant power generated by a charge of suitable explosive. While popular use is inclined to restrict the term to such weapons as can conveniently be used by hand, such as rifles, sporting guns, and pistols, these are more correctly termed small-arms (*q.v.*), and firearms includes even the largest artillery.

The history of firearms is, naturally, closely associated with that of explosives, but there is no doubt that in early times progress was far more dependent on the smith than the powder-maker, as the latter was always in a position to supply a more powerful explosive than could be used with safety in contemporary guns. The invention

of firearms is usually ascribed to a German monk, Berthold Schwarz, but the date is not definitely known. From illustrations and accounts in contemporary manuscripts, it is evident that guns were in use by 1320, and the English used them at Crécy, 1346. These were either bottle-shaped or tubular in form, and at first were employed to fire darts with either metal vanes or a leather pad in place of feathers, but spherical shot were early introduced, being usually made of stone, as the guns would not withstand the charge necessary to propel the heavier metal missiles.

The early guns were generally built up of wrought iron strips welded together, but some consisted of wooden staves bound with iron, and all were valued far more for the moral effect occasioned by the noise of their discharge than for the material damage caused. "Hand guns," which appear to have come into use about 1400, were merely smaller sizes of cannon mounted on a rough wooden stock, and all weapons were discharged by applying a piece of smouldering match to the touch hole.

#### Invention of the Flint Lock

The next improvement was the invention of the matchlock about 1460, and it was not until the invention of the flint lock early in the 17th century that this was generally superseded. Flint locks remained supreme until early in the 19th century, when percussion caps were introduced. During this time the only improvement in cannon was better construction, they were cast in bronze in the 15th century and in iron by the 18th. The advent of the wheel lock (*q.v.*) in 1515 had also made it possible to produce a practicable pistol, so that three distinct varieties of firearm, cannon, musket, and pistol, were in existence.

In order to increase the accuracy of weapons, rifled barrels were introduced about 1520, probably by August Kottler of Nuremberg, but the slowness of loading from the muzzle end with this type of weapon restricted its use to sporting weapons until the end of the 18th century when a few regiments of marksmen were formed. Not until breechloaders were definitely established did the rifle supersede the musket.

Breechloading guns have been known for some centuries. Henry VIII had a sporting weapon of this type, but the Prussian needle gun of 1841 was the first weapon in which the principle was applied

with any real success. With a view to increasing the rapidity of fire, double-barrel guns were introduced about the middle of the 17th century, magazine rifles about 200 years later, one of the earliest being the Winchester, 1867. Revolvers date from 1835 (Colt).

After 1880 improved construction and the advent of smokeless powder made possible the manufacture of weapons of great power and extreme accuracy; improved breech blocks and the absorption of the recoil by hydraulic buffers revolutionised artillery practice; through the use of the force of the recoil to reload, cock, and fire the weapon, machine-guns were produced which would fire 600 shots per minute.

Developments during the First Great War were in giving mobility to larger guns and howitzers; in the use of guns of immense power as instanced by anti-aircraft artillery and the German gun having a range of 80 miles, which threw 9.1-in. shells, weighing about 3 cwt. each, into Paris; the introduction of new types of ammunition; and the use of trench mortars, which were extremely light cannon, generally smooth-bored and often muzzle-loading, capable of firing heavy projectiles to short and medium ranges. In the Second Great War automatic firearms like the Thompson sub-machine-gun and the Sten carbine were used on a large scale. A further innovation was the rocket gun.

Under the Firearms Act, 1937, no person may normally have in his possession any firearm—except a smooth bore gun with barrel not less than 20 ins. long or an air gun, air rifle, or air pistol of a type not declared specially dangerous by the home secretary—unless he holds a firearms certificate. Such a certificate can be obtained for 5s. from the police, but the applicant must show good cause for having a firearm. A certificate remains in force three years. If the police refuse to grant one, an appeal can be brought to the court of quarter sessions. Among the persons to whom this restriction does not apply are crown servants, persons taking part in theatrical performances or films, starters of races, operators of miniature rifle ranges, and members of rifle clubs and cadet corps. Automatic weapons are forbidden. Firearms dealers must be registered. *See Ammunition; Arquebus; Bullet; Cartridge; Explosives; Machine-Gun; Ordnance; Pistol; Revolver; Rifle; Trench Mortar.*

**Fireback.** Back wall of a fireplace, introduced about the middle of the 16th century as a protection for the walls. Firebacks were of cast iron, often elaborately decorated with designs of flowers, figures, etc., in high or low relief. The most interesting series were those with coats of arms and other heraldic devices, with inscriptions.

**Firebrick.** Term covering all kinds of heat-resisting bricks used in the construction of such appliances as furnaces. Commonly it is restricted to those bricks made from fireclay (*q.v.*), while others are known by the predominant constituent in their composition, *e.g.* as silica-, chrome-, or magnesite-bricks. Pulverised fireclay is mixed with water and pressed into suitable moulds. After shaping, the bricks are slowly dried and finally fired strongly in special brick kilns.

**Fire Brigade.** Organization for combating outbreaks of fire. There apparently existed fire brigades in Egypt 4,000 years ago; an elaborate organization operated in Rome by 40 B.C. Early in the Christian era hose pipes appear to have been in use. For British practice, *see* Fire Service.

**Fireclay.** Material so called from the high refractoriness of the articles made from it, *i.e.* its quality (when manufactured) of resisting intense heat, and its freedom from splitting when exposed to rapid changes of temperature. The determining factor of the refractoriness is the chemical composition of the clay, which contains but small quantities of fluxing impurities (such as iron, lime, magnesia, alkalis), and little free silica. Fireclays should dry and fire without cracking and have an open texture to resist alternate heating and cooling. In the manufacture of some fireclays sawdust is mixed with the clay and is burnt on firing, leaving the open porous texture required. The minimum fusion point for a fireclay is usually taken at about 1,600° C.

Fireclays abound in the British coalfields, underlying or alternating with coal seams. They usually contain 50–70 p.c. silica and 20–30 p.c. alumina, the remainder being iron oxide, lime, magnesia, soda and potash. The beds do not usually exceed 2 ft. in thickness, and the presence of rootlets, coupled with the absence of alkalis, suggests that they represent the soil in which the coal measure forests grew—the plant débris formed the overlying coal seam. Deposits are worked in Cornwall, Devon, Dorset, and elsewhere in

the S. of England. Fireclay from Stourbridge, said to have been worked in the 16th century, is exported in quantity on account of its excellent qualities. *See* Brickmaking; Firebrick.

**Fire Control.** System under which two or more pieces of artillery are ranged or fired on a specific target under the individual command of an officer. During the Second Great War, fire was controlled in field artillery either by an officer in an advanced observation post who transmitted his fire orders to the battery by telephone, or by an observer in an aircraft who was in radio communication with the artillery. Anti-aircraft artillery was controlled by data as to bearing, height, range, and speed of the target set into a predictor (*q.v.*) after the picking up of a target on a radar screen. One master predictor controlled the fire of a number of guns.

In warships, fire was controlled from the citadel or control tower in battleships and cruisers and from the bridge in smaller vessels such as destroyers. From this control position the gunnery officer directed the vessel's guns either from personal observation of the target or from messages received from spotting aircraft. If necessary, the fire control officer could fire all the main armament simultaneously by pressing a switch. The development of radar revolutionised fire control for both land and ship-borne artillery, making it possible to control accurate and sustained fire against a target which might be moving under cover of thick smoke or fog. *See* Artillery; Gunnery.

**FIREDAMP.** The name given to the most important of the gases which are found occluded in the crust of the earth, *viz.* methane, or carburetted hydrogen (CH<sub>4</sub>), which appears in coal mines. When diluted with air in certain proportions it forms a mixture which will explode with great violence when ignited by a flame or spark, or by an incandescent surface. Such an explosion occurring in a coal mine may kill the workers directly by mechanical violence or by burning, or indirectly by carbon monoxide poisoning, since carbon monoxide is formed by the incomplete combustion of the gas.

FIREDAMP and marsh gas have the same composition, and both are formed by the decomposition of vegetable matter. Coal beds are porous and the gas accumulates in their pores, but large volumes sometimes accumulate under con-

siderable pressure in pockets, and when these pockets are tapped by a pick or a drill, or by a fall of coal or rock, the gas escapes into the mine workings and becomes a source of danger. A fall in the barometric pressure tends to release the gas; hence the importance to miners of weather forecasts. The volume of methane is sometimes so great that when a pocket of it is tapped the gas issues in a continuous stream or "blower" for several years. Attention is being given to the possibility of recovering methane (which is used as a fuel in the form of "bottled" gas; see Gas) from such sources. As a natural product of the coal measures, methane occurs in a remarkably pure state, containing less than 3 p.c. of other gases. All mixtures ranging from about 4 p.c. to about 14 p.c. of methane and air are explosive, but, by means of the flame safety lamp, the miner can detect the presence of less than one p.c. of firedamp in the mine air by observing the height of the pale-blue flame of burning methane above the oil flame.

**Fire-eating.** Branch of the juggler's art. It includes exhaling or swallowing flame, holding red-hot iron between the teeth, drinking molten substances, and similar pretensions. A writer of the 2nd century described breathing from the mouth of flame and smoke as arising from inflammable matter inside a nutshell wrapped in tow. In 1672 Evelyn saw Richardson chew and swallow glowing coals and brimstone, besides pouring molten lead—perhaps cold quicksilver—on his tongue. In 1762 Strutt saw Powell broil a piece of beefsteak upon his tongue with glowing charcoal placed beneath it. In 1814 Josephine Girardelli claimed to put molten lead into her mouth and to spit it out marked with her teeth. These effects were produced partly by utilising unfamiliar physical and chemical principles, partly by the performer's sleight of hand.

**Fire Engine.** Machine for extinguishing a conflagration. In 1650, Hautch of Nuremberg made a manually operated fire engine, but it was not very successful. A few years later Jan van der Hydens of Amsterdam invented an improved engine, adding to it later an air vessel and a combined pair of bucket and plunger pumps, the connecting rods to which were attached to a cross lever. The air vessel prevented shock and loss of power, and made it possible for the pumps to give a continuous

stream of water which was delivered through a branch and nozzle fitted to the delivery side of the pump. About 1670 the Dutch invented riveted leather delivery hose. These machines were fed from a cistern which had to be kept filled from buckets.

The first manual engine built in England is credited to Richard Newsham of London about 1724. It incorporated improvements by which water was sucked through a pipe line to feed the pump. A steam fire engine is said to have been made in England in 1829, but not until 1861 was the first horse-drawn steam fire engine adopted by the Metropolitan (London) Fire Brigade. The pump was a single throw piston type fitted horizontally on a carriage, the power to operate the pump being steam generated from a quick heating boiler. Later models had two double acting reciprocating pumps fitted vertically, driven by steam power; forced draught gave sufficient head of steam within 10–15 mins. of lighting the fire under the boiler. Steam propulsion was substituted for horses in 1902, and a year or so later the internal combustion engine superseded steam, a rotary pump being coupled to the driving shaft by means of gearing. The centrifugal pump was introduced in 1906; its impeller shaft was driven by intermediate gearing or belting by any available motive power. Like the subsequently developed reciprocating pump with three throw action, the pistons being in series, it was fitted into a chassis which was either towed behind another vehicle or had its own mechanical propulsion. See Pump.

**Fire Escape.** An appliance to assist the escape of persons who are trapped in a burning building. Fire escapes can be divided into two categories, those owned by the general public, and those owned by a fire brigade. Among the first are: (a) a rope ladder with wooden rungs permanently fixed under the window in a room and generally encased in a box; (b) a reinforced line fitted with a hook at one end to which a sling can be attached, the other end of the line being wound on a drum (with braking device to regulate the speed of the descending person) and enclosed in a metal container with a hook by which to hang it to a permanent fixed ring just inside or outside a window frame; (c) permanently fixed iron or other non-combustible staircase attached to and outside a building, accessible

from each storey by doors opening outwards, and either open or entirely enclosed in brickwork or other non-combustible material; and (d) an entirely enclosed staircase built inside a building as part of its general structure. Enclosed stairway escapes usually have fire-resisting doors on each floor, and are made, as far as is possible, smokeproof. Building by-laws in most cities require the provision of an external fire escape on all buildings having a floor more than 50 ft. above pavement level or occupied by more than 20 persons, and on all factories or workshops employing more than 40 persons.

Portable fire escapes were introduced in 1836, by the Society for Protection of Life from Fire, and were stationed with their attendants in streets of London and other towns. Eventually these escapes were taken over by the fire brigades. They were replaced in time by escapes comprising a series of extending ladders in three sections mounted on a two-wheeled sliding carriage. The ladders were lowered or raised by means of cables and a winch, which was usually mounted between the levers. This type of escape could be propelled by four men; or it could be carried on a fire brigade vehicle and unshipped when required. In cities and large towns fire brigades also have mechanical turntable, self-supporting ladders, some of which can be extended to 150 ft., mounted on a self-propelled vehicle whose engine is geared to a mechanism for extending, lowering, elevating, and rotating the ladders.

In the U.S.A. fire brigades use "aerial" ladders: these, mounted on a turntable swung by hand, and locked by a pin in the desired position, are extended by means of an endless chain and elevated by screw gear, both operations being carried out by hand.

Another fire brigade rescue appliance is the hook ladder, a short light ladder about 16 ft. long fitted with a folding hook, by the use of which firemen can scale a building of any height. These ladders are not intended to be used by persons other than firemen, who with their help fix lifelines to the upper storeys of burning buildings.

**Fire Extinction.** In principle, the limitation of factors causing fire. Such limitation can be effected in various ways, according to the nature of the fire. These include drawing off burning liquid

fuel when stored in tanks, the demolition of adjoining buildings containing combustible materials, the digging of trenches in heath fires, the removal of cargo from ships' holds, smothering to prevent air from feeding the fire. A container of burning oil, for instance, can usually be extinguished by putting an asbestos sheet over it, and at the same time cooling the exterior of the container with water. A person whose clothing is on fire should be made to lie on the ground and wrapped in a heavy rug. In general, water can be used for cooling, but it must *not* be used in dealing with burning magnesium, certain liquid acids, some alkalis, etc.

**FIRE EXTINGUISHERS.** Apparatus for extinguishing fire is of five types projecting respectively water, foam, vapour forming liquids, dry powders, and emulsions. Soda-acid machines generally consist of a container holding water and bicarbonate of soda with an inner receptacle holding liquid acid; when operated the chemical reaction between soda and acid creates an internal pressure that expels the liquid from the nozzle. In other types, a compressed gas takes the place of the acid; when the inner container is pierced by mechanical means this gas develops pressure in the receptacle, expelling pure water from the nozzle.

The foam hand extinguisher, similar in appearance to the soda-acid type, has separate combined chemical solutions, the inner compartment being charged with aluminium sulphate dissolved in water and the receptacle itself with bicarbonate of soda and saponin, liquorice, or turkey red oil dissolved in water. When operated the appliance projects liquid "foam."

Extinguishers expelling a liquid which vaporises rapidly when in contact with burning material may hold either carbon-tetrachloride or methyl-bromide (both fluids being non-conductors of electricity). Machines containing carbon-tetrachloride can be operated by (a) pump, (b) compressed gas, or (c) air-pressure. In methyl-bromide machines, a total discharge is given by piercing a copper disk with a pin, control discharge by a spring loaded plunger controlled by a trigger, or a wheel valve and cock.

Carbon dioxide ( $\text{CO}_2$ ), compressed into a cylinder in a liquefied state, when released by a valve vaporises; it is a non-conductor of electricity, and is useful for deal-

ing with fire of highly inflammable liquids at any early stage.

Dry powder extinguishers generally consist of finely ground bicarbonate of soda with precipitated chalk, whiting, sand, sawdust, fuller's earth, or dry pulverised clay. Powder extinguishers containing graphite and other finely ground chemicals have been developed to deal with incipient fire in particular materials, but are not suitable for household use. Emulsion extinguishers also are designed chiefly against special fire dangers in industrial premises.

The handpump or stirrup pump may be either single or double acting. The pump is placed in a receptacle containing water, and a length of hose is attached to the pump. Generally two operators are required, whilst a third person is needed to obtain further supplies of water. Garden hose fitted with a nozzle to a water-tap is easier to use. A siphon of soda water is useful for very small fires.

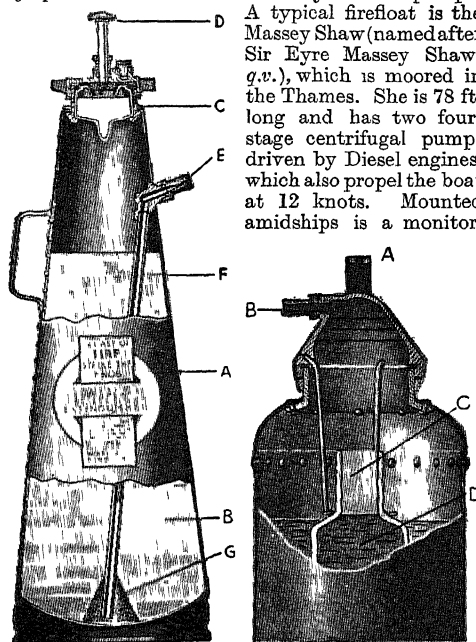
In large buildings and factories with inflammable contents an automatic sprinkler system is common. Piping at ceiling level is installed throughout the building; attached to the piping at equidistant points are sprinkler heads fitted with fusible links which melt at a predetermined temperature, thus opening a valve which emits a continuous spray of water. The area covered by each head depends upon its height above floor level and the pressure under which the water is discharged. The water is supplied by gravitation from a large storage tank in the highest point of the building.

In a building where trained staff are employed, on each floor sometimes stand fire hydrants opened by means of a wheel valve, when the hose and nozzle are connected to the hydrant it is often possible to cover the whole area of the floor. The hydrants are supplied either

by gravitation from a storage tank, or by means of rising mains from street level.

**Firefloat.** Motor vessel equipped for extinguishing dock, riverside, or ship fires or any fire which cannot be reached by wheeled pumps.

A typical firefloat is the Massey Shaw (named after Sir Eyre Massey Shaw, *q.v.*), which is moored in the Thames. She is 78 ft. long and has two four-stage centrifugal pumps driven by Diesel engines, which also propel the boat at 12 knots. Mounted amidships is a monitor,



Fire Exinction. Left, soda-acid extinguisher: A, steel vessel charged with, B, solution of sodium bicarbonate; C, glass bottle containing sulphuric acid, shattered by striking knob, D; E, jet, connected by tube, F, to base of extinguisher; G, strainer to prevent glass fragments from obstructing jet. Right, foam extinguisher: A, handle; B, nozzle; C, glass container; D, acid

Courtesy of Mather & Platt, Ltd.

or water gun, which can deliver  $1\frac{1}{2}$  tons of water a minute drawn from the river by the pumps. On each side of the deck above the engine room is a swivelling delivery head, each with four hose connexions. At the great Wapping fire in 1935, the Massey Shaw pumped continuously for six days. She was one of the ships sent to Dunkirk to assist in the evacuation of the B.E.F. One of the largest firefloats in the world is the Fire Fighter of New York; she is 134 ft. long, and has nine monitors giving a total water output of 22,000 gallons a minute at a pressure of 150 lb. per sq. inch.

**Firefly.** Name given to luminous beetles of the family Elateridae, found chiefly in the tropics. The glowworm (*q.v.*) is a different kind of beetle belonging to the family Cantharidae.

**Firefly.** Two-seater fighter reconnaissance aeroplane designed by the Fairey Aviation co. for the Royal Navy. It operated from

aircraft carriers. It was powered by the Rolls-Royce Griffon engine, and had a span of 41 ft. 2 ins., length 37 ft. 11 ins. Maximum speed of the Mark IV was 386 m.p.h. Coming into production late in the Second Great War, the Firefly served in all theatres of operations.

**Fire Guard.** Branch of British civil defence in the Second Great War. It was established by an order in council of Aug., 1941, whereby men between 18 and 60 were made liable to compulsory enrolment as fire guards where the Fire Prevention (Business Premises) Order was applied. A month later, all male British subjects between 18 and 60 were obliged to register for fire detection and prevention service. The only civilians excused fire guard duty were members of the Royal Observer Corps, police and special constables, doctors, seamen, and blind and insane persons. In 1942, liability for fire guard service was extended to women between 20-45, and the age limit for men was raised to 63. At the same time members of the Home Guard, part time civil defence personnel, police, and the Royal Observer Corps had to perform a specified number of hours of fire guard service.

Fire guards were given protective helmets and brassards, and were at first linked with the wardens' service, but on Jan. 28, 1943, they became a separate body called the Fire Guard Service, and worked in cooperation with the National Fire Service. Each N.F.S. station area was subdivided into fire guard sectors, each under the control of a Fire Guard section captain, the latter being usually appointed by the local authority. The fire guard sectors were further subdivided into street or block party areas, each with 20-30 fire guards under a party leader.

When the service was suspended on March 24, 1945, it had a strength of nearly 5,000,000 men and women.

**Firelock.** Musket in which the means of igniting gunpowder was by flint and steel. Adopted in England c. 1690, it replaced the matchlock, which required a burning match to discharge it. The drill command "Shoulder your firelock" was used before "Shoulder arms" came into use. It was also known as Flint Lock (*q.v.*).

**Fire-making.** Intentional production of flame, spark, or glowing heat. Of primeval invention, it

became one of the mightiest factors in human culture. Natural manifestations of fire were doubtless feared before man perceived its beneficent possibilities. Use gave rise to preservation, preservation to production at will.

Fire-making may have originated in wood-friction. A Moustarian beechwood fire twirl (Tylor's fire drill) was found in 1904, at Krapina, in Croatia. Fire twirls are rotated between the palms in Australia, as in ancient India and Mexico, are aided by a cord by the Maoris, and by a bow in early Egypt; they are gripped by the teeth by the Eskimo, and weighted with a spindle-whorl by the Chukchi. Other frictional appliances are stick-and-groove fire ploughs rubbed along the grain in Polynesia, and fire saws rubbed across the grain by the Malays. A pneumatic fire piston is peculiar to modern S.E. Asia. The primeval percussion implement—strike-a-light—resulted from flint-knapping, and flint and pyrites developed into the early iron-age flint and steel. See *Lighter*; *Match*; *Tinder-box*, etc.

**Fireplace.** Recess in the wall of a room, formerly consisting of an open space walled on three sides by stone or bricks, but now generally fitted with a metal fitting, which contains a fire for space heating. The earliest form of fireplace is commonly believed to have been the hearth in the centre of a room, but there is evidence that the wall fireplace has an equally long ancestry. In the Norman keep, for example, where the rooms were placed one over the other, wall fireplaces were the rule, since a central hearth in any but the topmost room would have been an impossibility.

Extant specimens show that these fireplaces were recesses in the wall surmounted by round arches. There was no chimney shaft; the smoke escaped by a short flue leading almost directly to a small vertical opening in the outside wall, concealed in the angle of a buttress. In one-storeyed buildings the central hearth was often used, and this type of fireplace persisted until late in the 16th century. The great hall at Richmond Palace, and the hall at Penshurst Place, Kent, retain examples.

The opening in the roof, through which the smoke was carried, was protected by a small turret, or *louvre*, which kept out the rain while allowing the smoke to escape. Chimney shafts began to appear about the middle of the

13th century, but were not carried above the level of the eaves until considerably later, and it was not until Elizabethan times that the chimney stack was developed as an architectural feature. Then the number of fireplaces greatly increased, calling for a corresponding enlargement and beautification of stacks to contain the flues (see *Chimney* illus.).

Gothic fireplaces are generally treated in the simplest manner. The hood, sometimes with corbels, is the chief and only decoration of most 13th century fireplaces, and the single square-framed arch which followed it was equally devoid of ornament. The Renaissance brought the architectural chimney-piece and elaborate overmantel, and though there was a return to greater simplicity in the Later Renaissance, the taste for a decorated fireplace had taken firm hold. See *Building*; *Chimney-piece* illus.; *House*.

**Fire Prevention.** Fire prevention begins with the education of the public to avoid acts likely to start fires. Brigade records show that most fires result from the careless use of matches and the discarding of lighted cigarette ends. Fires frequently start in rubbish, which should always be placed in metal containers, and should be periodically cleared from cellars, attics, and other out-of-the-way places, where accumulations of old boxes, furniture, and paper feed a fire once started. Oily rags and certain other sorts of waste material may ignite spontaneously.

Portable stoves and heaters should be placed on non-combustible bases well away from woodwork. Gas rings should be placed on a sheet of metal over a sheet of asbestos if they are used on a wooden table or shelf. A ventilated thimble providing adequate air space between thimble and woodwork should be used when an iron stove pipe passes through a floor or other partition of wood. Gas fires should always be fitted with solid metal piping, and gas rings with flexible metallic tubing with screwed metal connections. The containers of oil stoves should be free from leaks; and oil stoves and lamps should never be filled in the presence of naked lights. Regular cleaning and general overhauling of all these appliances are necessary.

Petrol, benzine, and similar volatile liquids should be handled with great care. It is an extremely dangerous practice to clean clothes

with petrol, etc. The use of naked lights should be prohibited in garages.

Fires in fireplaces should be raked out if the room in which they are burning is to be left empty for any lengthy period. Burning coals should not be moved from one fireplace to another. Hot ashes should be placed in metal dustbins. It is dangerous to pour paraffin from a can on to a sulky fire to make it burn. Tops of ovens and stoves should be kept free from grease, and chimney flues regularly swept.

#### Fire Hazards in the Home

Electric appliances, *e.g.* irons and kettles, should be switched off when not in use, and damaged flexible cord should be renewed. Flexible cord should not be hung on nails or hooks, and it is unwise to fit any paper or fabric shade nearer than two inches to any electric bulb. The fuse is the safety valve of the electrical system, and when blown should not be replaced by a fuse wire giving higher amperage, or by anything except fuse wire.

The unprotected flames of gas or candles should not be placed near windows where curtains can blow on to them. Pendant gas lights require coiling shields. Swinging gas brackets should not be used. Candles should be fitted in proper holders.

All heaters, whether electric, gas, or coal, should be protected by a metal guard, to prevent contact with light fabrics that catch fire easily. Many fires are caused by airing clothes too close to a fire. A naked light should never be used to look for a suspected gas leakage; the main cock at the meter should be turned off and word should be sent to the gas supply office. Heath fires are caused in dry weather by careless picnickers who drop lighted matches and cigarette ends or do not completely extinguish picnic fires.

Dangerous fire hazards in industry include the presence of (a) explosives and compressed "permanent" liquefied and dissolved gases; (b) substances which ignite by the interaction or absorption of moisture and/or air; (c) substances with a flash point below 150° F.; (d) oxidising agents and substances liable to spontaneous combustion and readily combustible solids, such as wood sawdust and shavings, paper, loose fabrics, fibres, and similar materials, and certain finely powdered materials; as well as processes involving the application of

heat, especially with combustible materials, *e.g.* in drying rooms, nitrate salt baths, etc.; the production of inflammable waste or dust; processes associated with spray painting with inflammable or explosive liquids, and the use of inflammable solvents. Managements should adopt all possible precautionary measures to prevent fire, and provide appliances for quelling any outbreak at once. Fire precautions in some factories, such as those manufacturing explosives or celluloid, and those engaged in refining inflammable oils, are prescribed by statutory regulations.

Regulation of fire prevention in Great Britain is, with one or two exceptions, delegated to local authorities, which, either by special acts of parliament or by local by-laws framed under the Local Government Acts, insist on certain precautions being taken against fire in the construction of buildings, *e.g.* as regards construction of flues and hearths. The occupier of premises in which a fire is lit is bound to secure that it does not spread, and is legally liable for the damage if it does. Where a fire starts accidentally, he is not liable unless he has been negligent. The London Building Acts contain provisions designed to give protection against fire. Without the consent of the L.C.C. buildings must not exceed a certain height; warehouses and buildings used for trade or manufacture, if exceeding 250,000 cu. ft., must be divided by walls into divisions not exceeding 250,000 cu. ft.

**Fireproofing.** Misnomer popularly applied to methods designed to render materials or structures fire-resistant. Few materials and no buildings can sustain the application of intense heat for any length of time without suffering some damage. If the fire is hot enough, even steel will melt, and brick and concrete will fuse; there have been fires so hot that the materials of construction have actually flowed.

No method has yet succeeded in rendering any material incom-bustible; so-called fireproofing merely makes it less inflammable than it was. By means of chemical treatment it is possible so to alter the structure of certain materials that, in the event of their catching fire, they will smoulder or burn away slowly without bursting into flame. Materials thus treated are fire-resistant, as, if flame can be avoided, the risk of a fire spreading is reduced.

Wood may be made fire-resistant by impregnating it with sulphate of zinc and silicate of soda and tungstate. In order that the solution may penetrate the pores of the wood, the air is exhausted from the timber by keeping it under a vacuum for some time before the solution is introduced. In addition to solutions intended to penetrate wood, fire-resistant paints are used for superficial coating. Most of these paints have an asbestos basis, but while imparting a certain fire-resistant property, they are liable to peel off. Two or three applications of lime-wash will also render timber non-inflammable.

#### Fire-resistant Chemicals

Other agents used to render materials less inflammable include common salt, alum, sulphate of ammonia, sulphate of soda, sal ammoniac, borax, sulphate of lime, lime water, ammonium phosphate, ferric sulphate, aluminium hydroxide, and aluminium sulphate. These substances are applied by soaking the material in them in salt solution, and act by depositing minute crystals in the pores of the material. Closing up the pores with a non-inflammable substance denies access of air, so that in the event of fire the material merely chars superficially and does not burst into flame. Aluminium phosphate leaves an earthy deposit, when heated, which covers the material and resists the action of flames, while ammonium phosphate coats the material with a glossy protective covering of phosphoric acid. With most of these substances, it is necessary periodically to renew their application to the material, particularly in the case of fabrics such as are used for theatre curtains, as the crystals are only held mechanically in the pores of the material and repeated movement, gradually shakes them out.

Rendering a building or other structure fire-resistant is a matter of design and selection of materials rather than of so-called fireproofing. The materials which naturally offer most resistance to the action of fire are brickwork, firebrick, terra-cotta, plaster, iron, and steel. Next to good brickwork, reinforced concrete is the best fire-resisting material; it is very strong and takes up less space than brick.

To be classed as fire-resistant, a building should have a steel frame with several inches of concrete or tile covering every single piece of steel, particularly the



beams and columns. No built-in wood of any kind should be used; windows, doors, mouldings, skirtings should all be of metal or other non-inflammable material.

Each storey of the building should be, in effect, separated from those above and below by fire-resistant floors, while each storey should be subdivided by means of fire-resistant doors. It should be possible to close securely all exits from rooms in order to confine the fire, and to seal lift shafts and stairway wells with fire-resisting traps on each floor.

Fire-resisting floors are of various types. Filler-joist floors consist of rolled-steel girders supporting small section "filler" joists, with the panels between the joists and all the steelwork filled in and covered with concrete. Hollow tile floors are made up of clay or terra-cotta tiles or blocks laid in concrete and reinforced with steel rod. Concrete floors are built up concrete laid on steel mesh.

Automatically closing doors are used to isolate any part of a floor on which fire may break out. The doors are usually hung on an overhead track set at a rake so that the door tends to close itself. When open, the door is held by a cord or chain, fixed to the wall by a fusible link, passing over a pulley on the end of the track and carrying a counter-balance weight. In the event of a fire, the heat melts the fusible link, and the weight drops, closing the door. The doors are usually made of two steel plates  $\frac{1}{2}$  in. thick having a core of asbestos. Thermostatically controlled roller doors or shutters are sometimes used in place of sliding doors.

To reduce the risk of window breakage in event of fire, which induces draughts that will fan the flames, fire-resistant glazing, i.e. glass at least  $\frac{1}{4}$  in. thick reinforced by a wire mesh made from metal having a minimum melting point of 1,800° F., is used.

**Fire Raising.** Term used in Scots law for the act of wilfully setting on fire the property of another. The English equivalent is arson (*q.v.*).

**Fire Service.** Body charged with the duty of extinguishing conflagrations. In 1189 the ward-motes of the City of London ordered "all persons who dwell in great houses within the ward to have a ladder or two ready to succour their neighbours in case of fire, and to have in the summer time a barrel full of water for quenching fires." Under Edward I

watchmen were appointed who between sunset and sunrise were to give alarm in case of fire, and some attempt was made to provide organized cooperation, e.g. the city of Worcester in 1467 ordered "bucket carriers to be ready with their horses and buckets to bring water to every citizen when a fire occurred in the city." Failure to do so entailed a fine of forty pence. In 1583 the City of London ordered houses to be pulled down with engines, hooks, and ladders to prevent the spread of fire. (Houses in those days were built of wood.)

By 1774 every fire insurance company maintained its own fire brigade and fire engine, manned by volunteers, who were paid for attending fires on property insured by the particular company. In order that such property could be easily recognized, the company affixed its plate to insured buildings. The London Fire Engine Establishment was formed in 1833. It was supported by the insurance company brigades, an arrangement that continued until 1865, when the Metropolitan Board of Works established the Metropolitan Fire Brigade, under the command of Sir Eyre Massey Shaw. The equipment in 1866 consisted of seven large and 14 small steam fire engines, 64 manual fire engines, and two floating fire engines. In 1889 the Met. Board of Works was superseded by the London County Council, but the brigade changed its name to the London Fire Brigade only in 1904.

The city of New York, U.S.A., had a fire brigade by 1835, since it is recorded that on Dec. 6 of that year "a destructive fire occurred when 600 buildings were entirely destroyed as the firemen were powerless on account of the almost instantaneous freezing of the water in the engines."

Some of the larger cities of the U.K., including Manchester, Liverpool, Salford, Glasgow, and Belfast, were granted special powers by the government between 1845 and 1865 to establish fire brigades.

During 1866 to 1938, various enactments gave local authorities in Great Britain power to establish fire brigades, but did not compel them to do so, and it was usual for the authorities to supply engines and appliances for the rates, but to leave it to volunteers to man them. The Fire Brigades Act of 1938 made it compulsory for all borough, urban, and rural councils to provide both fire appliances and personnel, the costs being borne by the ratepayers,

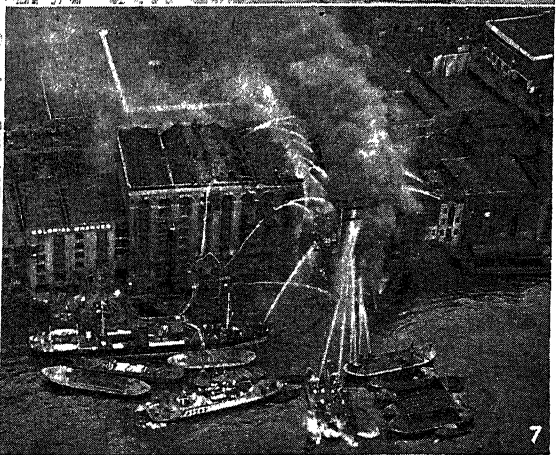
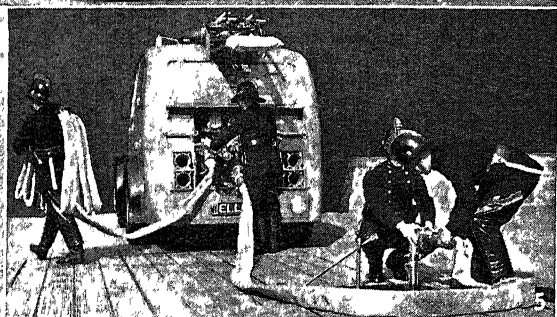
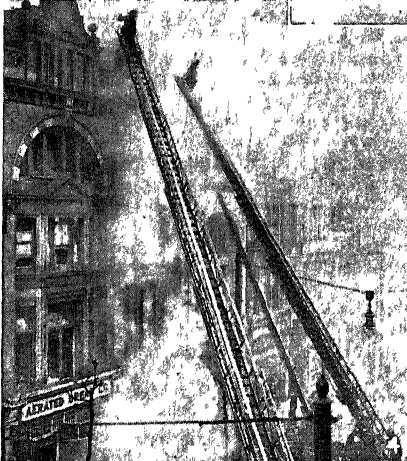
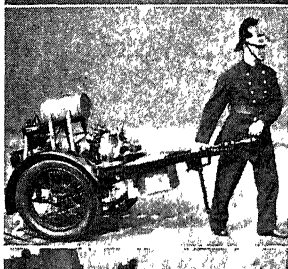
and to maintain them at a prescribed standard of efficiency.

In 1939 the fire brigades were included in the civil defence forces, and expanded both as to personnel and appliances at the cost of the government. Volunteers, forming the Auxiliary Fire Service, were trained by members of the regular fire brigades. Great Britain and Northern Ireland were divided into areas, and the fire brigades were grouped into districts each with a central control so that they could be mobilised quickly for service wherever needed. During 1940 and 1941, enemy air attacks on cities and towns grew so heavy that there was a grave possibility of breakdown in the fire services; and in May, 1941, the Fire Services (Emergency Provisions) Act was passed. This transferred the control of the fire brigades from local authorities to a central administration, the minister for Civil Defence becoming responsible for the reorganization of the fire brigades into the National Fire Service. This was divided into regions for administrative purposes, and each region was subdivided into fire force areas under fire force commanders. The government bore the cost, except that each borough, urban, and rural council had to contribute annually to the Exchequer 75 p.c. of its pre-war expenditure on its fire brigade. The strength of the N.F.S. in 1942 was approximately 100,000 men and women; 700 were killed in action, and about 7,000 were injured during the war.

The National Fire Service was dissolved by an Act of 1947. Instead of allowing the 1,668 local authorities of the 1938 Act to resume control, however, the Act of 1947 set up 141 local fire authorities under county councils and county boroughs, with four county councils and six district schemes in Scotland. Some central control and direction was retained, and part of the costs of complying with the standard laid down was borne by the Exchequer.

**Fireship.** Wooden vessel filled with combustibles that used to be set on fire and made to drift down upon an enemy fleet when it was at anchor or in harbour. The fireships were sent in thus to create panic or set on fire enemy vessels as they came in contact with them. The coming of steel and steam made the fireship obsolete.

A notable instance of the use of fireships was the attack made by means of them on the French fleet in the Basque Roads on April 11,



1. Headquarters of the London Fire Brigade at Lambeth. 2. Light trailer pump. 3. Fire engine, equipped with turntable ladder. 4. Firemen on extended turntable ladders, dealing with a burning

London store. 5. Fire engine fitted with Diesel compressed-ignition motor pump. 6. Thames fire float, with monitor or water gun mounted amidships, and here at practice. 7. Firefloats at a wharfside blaze.

#### FIRE SERVICE: EQUIPMENT AND ACTIVITIES OF LONDON'S FIREFIGHTERS

1809. At Lord Cochrane's suggestion eight fireships and three explosion vessels, containing 1,400 barrels of powder with 400 shells and thousands of hand-grenades, were sent against the French on a dark night. So great was the panic caused by the explosion of these vessels that most of the French crews cut the cables and allowed their ships to drift ashore. An earlier use of fireships was against the Spanish Armada.

**Fire Step.** Term in military engineering. It is the raised portion of a trench on which a rifleman stands to fire over the parapet or through the sandbagged loopholes.

**Fire Tactics.** Term used for arrangements made to bring hostile troops under effective fire, whether from small arms or artillery. Fire tactics included both the dispositions made of the troops who brought fire to bear and the control by which the fire was directed. Some troops were if possible placed in a position to bring enfilade fire to bear on the enemy, while indirect fire, brought to bear from a position invisible to the enemy, was usually demoralising. Surprise effect was frequently obtained in defence by the withholding of fire by some units until a definite stage had been reached by the attack, and in attack by working some units round to a position in which the enemy did not expect them.

Another form of fire tactics was to site machine-guns in concealed positions covering an area over which an attack was expected; fire was held until the attacking troops had passed, when fire was opened on their rear.

In covering fire used during the Second Great War to enable unsupported infantry to assault an enemy position one Bren gun section compelled the enemy to keep under cover by spraying his position with automatic fire while the riflemen and a second Bren section advanced. The latter section then opened fire while the first advanced. Where no automatic weapons were available, the infantry advanced in waves, one wave giving covering rifle fire while the other advanced.

Fire tactics were also applied to artillery. Thus barrage (*q.v.*) fire saturated the enemy defences, compelling him to keep under cover and cutting his communications with the rear while the infantry advanced to the assault. In counter battery work, the artillery on one side maintained steady fire on the enemy artillery



Fire-Walking. Indian practitioners of the rite, marching over glowing charcoal

and so prevented him from supporting his own infantry. See Artillery; Fire Control; Tactics.

**Fire-Walking.** Magical rite practised by several primitive peoples, mainly to ensure sunshine and bountiful crops. The celebrants walk barefoot over heated stones or embers, and are reputed to emerge unscathed. S. P. Langley, witnessing a ceremony at Tahiti in 1901, found that the volcanic rock used was a bad conductor, the upper surface being only moderately warmed. W. L. Allardyce, watching it in Fiji in 1904, reported that a handkerchief was charred by the stones, and

that a thermometer registered an air temperature over the pit of 280° F. Other modern accounts come from Mauritius, New Zealand, Japan, China, India, and Bulgaria. The rite sometimes consists in passing through flame, especially as an act of devotion, a custom preserved among European rustics when leaping over bonfires "for luck."

Fire-walking as a chastity or sanctity ordeal was recorded in early Vedic India (c. 1200 B.C.), passed into medieval Europe, and in the form of treading barefoot over nine glowing ploughshares was successfully accomplished by Queen Emma, mother of Edward the Confessor. See Ordeal.

**Firewatcher.** Member of a section of the A.R.P. organization during the Second Great War. By a ministry of Home Security order of Sept. 22, 1940, a firewatcher had to be on duty at all times on all premises in which more than 30 persons were employed. The duty of the firewatcher was to deal with any outbreak of fire at the earliest possible moment with the means at his disposal, and also to inform the fire service. Firewatching was suspended March 24, 1945. See Fire Guard

**Fire-Water.** Generic, popular name for any spirituous or distilled liquor, originally used by the natives of half-civilized lands for European cordials. It is akin to the Spanish name for brandy, *aguardiente*, or "burning water," to the Celtic *usquebaugh* and the French *eau-de-vie* or "water of life." See Brandy.

## FIREWORKS: FOR DISPLAY AND WAR

Alan St. H. Brock

*This article, which traces the development of fireworks and explains their composition, is supplemented by shorter ones on the various particular forms of firework, e.g. Rocket; Roman Candle; Squib. See also Flare; Gunpowder*

The art of firework making, or pyrotechny, is of great antiquity and seems to have originated in central Asia, although its subsequent development there has not kept pace with that in the W. A firework may be defined as a case, generally of rolled paper and cylindrical, containing a combination of ingredients capable of burning independently of atmospheric oxygen. To achieve this result one component must possess a supply of oxygen which it gives up readily to the other, or others, during combustion. The first chemical compound used for this purpose was saltpetre (potassium nitrate), which is found in surface deposits throughout Asia; and

the earliest experiments in firework making were probably the result of observing the effect when some saltpetre happened to fall among the ashes of a wood fire, causing the embers to splutter and glow. In course of time, another readily burning ingredient, sulphur, was added, and so the components of gunpowder were brought together. It was not, however, until the 12th century, when the German monk, Berthold Schwartz, invented the principle of the gun, that the most suitable firework composition came to be known as gunpowder.

Firework mixtures seem to have been introduced into Europe by returning crusaders and first

developed in Italy. In 1540, Vanzuzio Biringuccio, of Vienna, produced *De la Pirotechnia*, the first serious work on the subject. By the middle of the 16th century, firework displays of a primitive kind became fairly frequent on the Continent. Stowe records that Henry VIII brought over two Dutchmen, who made hollow shot of cast iron "stuffed with firework or wyld fire," but not until the reign of Elizabeth was anything in the nature of a set display given in Great Britain. In 1572 the Earl of Warwick entertained the queen with a display of fireworks in the Temple Fields. Others given in her honour were at Kenilworth two years later, where "there were fireworks showed upon the water which were both strange and well executed," and at Elvetham, by the Earl of Hertford in 1591.

During the 17th and 18th centuries many displays were given in celebration of coronations, royal weddings, births, peace, etc. The somewhat limited variety of effects it was then possible to produce was supplemented by elaborate scenic structures in the form of classic colonnades and temples, illuminated from within to show transparent pictures. An outstanding example was the "Temple or Machine" erected in Green Park, London, to celebrate the peace of Aix-la-Chapelle, 1749. Over four hundred ft. in length, it was adorned with "frets, gilding, lustres, artificial flowers, inscriptions, statues and allegorical pictures, etc." Fireworks provided one of the principal attractions of such pleasure gardens as Marylebone, Vauxhall, and Ranelagh, which sprang up during the 18th century. At these, more or less elaborate scenic settings provided backgrounds for the pyrotechnic displays. At the end of the century the employment of potassium chlorate enabled colours to be introduced, and, with the increasing variety of effects it was possible to produce, the use of scenic aids gradually declined.

The displays carried out by Brock at the Crystal Palace from 1865 to 1910 and from 1919 until the destruction of the building by fire in 1936 were, perhaps, the most important factor of the development of the art. The peace displays, in Hyde Park, July, 1919, and on the Thames, June, 1946, were highly elaborate and extensive.

**COMPOSITION AND CONSTRUCTION.** Firework compositions always contain an oxygen-supplying

chemical, such as the nitrate or chlorate of potassium, together with burnable substances such as sulphur, and charcoal and carbon compounds such as resins, gums, starch, etc. To these are often added metals either in a pure state finely divided or as salts. Iron and steel filings are introduced to produce sparks and coruscations; powdered magnesium and aluminium give dazzling brilliant flame

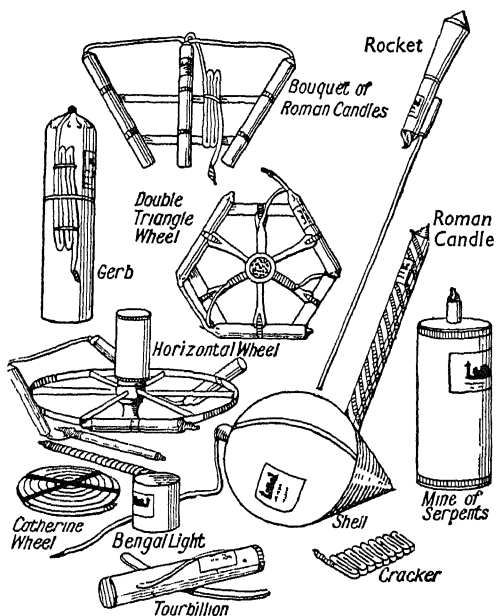
candles and rockets. When extra force is required, the case is "choked," either by a diaphragm of clay with a central hole of the requisite size or by constriction before the case is dried.

Tourbillions and Saxons have the ends of the case closed with clay and a horizontal hole bored near either end so that the fire issues at right angles to the axis. The holes in the Tourbillion rotate

the case on a piece of curved wood secured to its centre, and secondary holes pointing downwards project it into the air. The Saxon, or Chinese flyer, revolves on a nail, fixed horizontally, driven through the centre of the case.

Compound fireworks are composed of a number of the foregoing, fixed to wooden frameworks in the form of wheels or geometrical patterns. In the revolving pieces the motive power is supplied by gerbs or turning cases, which are in effect small rockets without heads.

The best known pieces are rain-



Fireworks. Various types of fireworks in popular use for displays and illuminations

either with or without sparks. Metal salts, in conjunction with potassium chlorate, produce coloured fires: those of strontium produce red, of sodium yellow, of barium green, and of copper blue.

The usual method of construction is to charge a case of strong paper rolled on a former with the composition. The lower end of the case is closed by constriction or, where necessary, by a diaphragm of compressed clay. The lighting end is "primed" with an easily ignited and hotly burning composition, its function being to start the combustion of the contents of the case. Some types of firework are so designed that the case burns down with the composition; these include coloured lights, starlights, and the small "lances" used to outline designs and set pieces. With others the case remains unburned, and the fire is projected with greater force from the mouth of the case. To this type belong fountains, roman

bow, single and double triangle or caprice wheels, revolving fountains, Saxon cross, chromatrope, and tree piece. The fireworks are connected on the framework with quickmatch—cotton wick soaked in a paste of starch and gunpowder, dried, and threaded in a paper tube. Lancelwork pieces are carried out with small coloured fireworks or lances spaced at short intervals following the lines of a design or picture and connected by quickmatch. The real development of lancelwork, which had hitherto been used merely to outline spokes and scrolls on wheels and for similar purposes, dates from 1875, when portraits and other pictorial effects were introduced in the displays at the Crystal Palace.

Aerial fireworks, such as rockets and shells, are those which produce their effects in the air. Shells are hollow spheres of papier maché filled with stars, or other pyrotechnic effects, and bursting

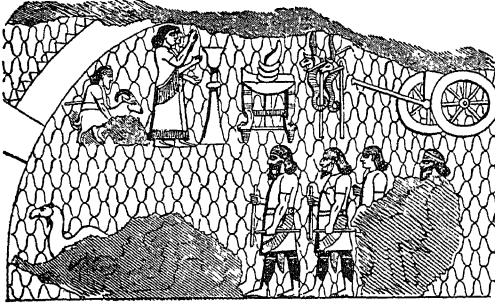


charge. They are fired from a mortar by means of a lifting charge of gun-power in a conical bag fastened to the lower side of the shell. The quickmatch which lights the lifting charge also ignites a time fuse at the top of the shell, which again ignites the bursting charge and contained effects upon reaching its maximum height.

In addition to their spectacular entertainment value, the uses of fireworks include life saving and communication at sea, by means of line-carrying rockets; distress signals and flares; the destruction of vermin by poisonous smoke emitted by fireworks made for the purpose; "bird scarers" designed to explode at regular intervals; and starters for Diesel engines. In war pyrotechnic signals provide means of recognition and communication, both on land and sea. Rockets emitting coloured stars, Very lights (a development of the roman candle designed to be fired from the barrel of a specially constructed pistol), and bombs discharged from mortars are used. Illuminating flares suspended from parachutes were employed during the Second Great War by the Royal Air Force on night operations. A distress signal, burning with a brilliant red flame and throwing up a succession of red stars, saved the lives of many airmen who had taken to their dinghies after coming down in the sea. Firework mixtures, burned in metal canisters, were also employed to lay smoke screens to conceal troop movements from enemy observation.

**Fire-Worship.** The ritual expression of reverence for fire as a natural element affecting human welfare. It is traceable in Dahomé, among the Ainu, some Mongols, and American Indian tribes. In ancient

Mexico, Xiuhtecutli was revered with daily offerings and periodic rekindlings before his image. The cult prevailed in early Aryan India, whose fire-god Agni, personifying earth-kindled fire, lightning, and solar heat, was reborn daily of ten maidens, the fingers which twirled the sacred fire-drill. Honoured by 200 Vedic hymns, his ritual still survives here and there.



Fire-Worship in ancient Nineveh. Fire-altar and sacrifice from a bas-relief at Kouyunjik, Assyria. Upper picture, fire-altar from Khorsabad, Assyria

In early Persia a less developed fire-worship appears in the Avesta, wherein Atar, a son of Ahuramazda, shares his conflict with darkness and impurity. In the Mazdean ritual, sacred fire, preserved in fire-temples, is not an object of worship but an emblem of divine power. This view is maintained by its modern exponents, the Persian Gabars and the Indian Parsees. At Baku, on the Caspian Sea, 18th century pilgrims gathered for expiation before stone temples near the burning oil wells. Many phases of culture exhibit fire-rituals loosely classed as fire-worship. The perpetual fires of the Greek *prytaneum* and the Roman *regia* with its vestal virgins were forms of Aryan hearth-ritual. These rites survive, with much primitive superstition, among E. European peasantry, and in Damaraland. The Semitic use of perpetual fire-altars for burnt offerings, passed into the ceremonial lights of ritual Christianity. See Moloch; Sun-worship; Zoroastrianism.

**Firing Party.** Squad of soldiers, sailors, or airmen, who fire volleys from small arms at intervals for some special purpose, such as a military execution, or as a

salute at a military funeral. At funerals the firing party marches with the cortège with reversed arms.

**Firing Pin.** Pin that strikes the cap of a cartridge in a rifle or other firearm using cartridge ammunition. In a rifle the firing pin passes through the bolt, and when the bolt is pulled to the rear the firing pin compresses a spring and is held by a sear which engages with a bent. When the bolt is pushed forward to ram the charge into the breech, the firing pin remains to the rear, and is in the cocked position. Upon the trigger being pressed, the sear is disengaged from the firing pin and flies forward to strike the cartridge cap and so fire the round. A similar principle actuates the firing pin of automatic small-arms and machine-guns, except that the bolt is operated by the discharge of the rounds. In the Sten machine carbine the firing pin is fixed to the face of the bolt and has no independent action.

**Firkin.** Old English ale measure, the fourth of a barrel, or 9 galls. Originally it varied from 7½ to 8 galls., and now it would equal 9½ imperial galls. As a small wooden cask to hold butter, a firkin contains 56 lb. The word is derived from Dutch *vierde*, fourth, and a diminutive suffix *kin*.

**Fire Beacon.** Eminence in Sussex, England, 3 m. S.E. of Lewes. It rises 718 ft. above sea level and gives views of the English Channel from Newhaven to Seaford, the Weald, and into Kent.



Fire Beacon, Sussex. On the summit is a tumulus broken down by the generations of fires lighted on it

**Firlot** (Four lot). An obsolete Scottish measure of dry capacity, being the fourth part of a boll. It varied for wheat and barley, and in different localities.

**Firm** (Span. *firma*, signature). Word used for an association of business men. In commercial circles of the 17th century and thereabouts it was used for a business signature one that

clinched a deal, and was then applied to the business house that signed. It is now the legal term for members of a partnership (*q.v.*). See Business Names.

**Firmament** (Lat. *firmare*, to make firm). Term used for the vault of the heavens. It is used to translate the Hebrew word *rakia* (Gen. 1, v. 6), which originally meant any-

thing extended or stretched out, and then refers to the universe.

**Firminy.** Town of France. It is in the dept. of Loire, 8 m. S.W. of St. Etienne, and is situated in a coal district which normally employs over 4,000 men. Other industries are steel and iron manufactures, also those of woollens, buttons, and ribbons. Pop. 20,362.

## FIRST AID: HOW TO HELP THE INJURED

H. E. Davison, M.D., Examiner, St. John Ambulance Association

*This article is one of a group that includes Ambulance; Hospital; Red Cross. See also Dressing Station; Medicine; Surgery*

First aid is a term for assistance which may be given in cases of accident or sudden illness before medical advice can be obtained. A knowledge of the principles of first aid has been promulgated widely in Great Britain by the operations of the St. John Ambulance Association; the British Red Cross Society; the St. Andrew's Ambulance Association; and educational authorities. During the two Great Wars, men possessing first aid certificates from any of these associations proved of great value in augmenting the established strength of the Royal Army Medical Corps, and, in civil life, in undertaking stretcher-bearer and dressing-station duty during air raids.

**HAEMORRHAGE AND WOUNDS.** Bleeding demands priority of attention in any accident. It may be stopped by firm and continuous pressure upon the bleeding point, or on the appropriate pressure point in arterial haemorrhage. All dirt, etc., should be removed and the wound be thoroughly cleansed with boiled water and dressed with clean lint, linen, or cotton. Out of doors, a wound should never be bathed unless one can be certain that the water is clean. A handkerchief, if clean, should be applied to the wound, or, if only a soiled handkerchief is available, the inside of an envelope may be placed next to the wound, and the handkerchief used as a bandage.

**FRACURES.** These should receive attention before any attempt is made to remove the patient from the place of accident. Treatment should be directed towards the immobilisation of the broken bone. Splints consisting of any rigid material, like wood from boxes, stout cardboard, walking sticks, umbrellas, broomsticks etc., should be applied and held in position by extemporised bandages. If practicable the splints should be of such length and so

arranged that the joints above and below the seat of the fracture are kept at rest. In fractures of a bone of one of the limbs, the limb should be gently straightened before the splint is applied, and for the upper limb support should be afforded by a sling.

In dislocations the limb should be placed and supported in the most comfortable position, and cold dressings applied; but otherwise not treated except by a doctor, as by unskilled manipulation grave damage may be done to blood-vessels and nerves in the neighbourhood of the joint.

In sprains a firm bandage should be applied and kept wet by the application of cold water. If the ankle is sprained out of doors the boot should not be removed until the patient returns to his house, as a laced boot acts temporarily as a useful support. Whenever it is doubtful whether the injury sustained is one of sprain or fracture the case should be treated on the assumption that it is a fracture.

**BURNS AND SCALDS.** Treatment should be directed towards the exclusion of air from the injured part. This may be effected most readily by the immersion of the part, if a limb, in warm water in which bicarbonate of soda has been dissolved. The burn or scald should then be dressed as soon as possible with strips of lint, linen, or cotton, covered with some antiseptic ointment, *e.g.* boracic ointment. Any clothing adhering to the burned flesh should be allowed to remain, the remainder of the garment being cut away.

**BITES AND STINGS.** Bites of animals should be cauterised by a liquid caustic, such as pure carbolic acid or caustic potash, but if no such fluid is at hand, a red-hot wire should be used. If there is any suspicion that the animal which has inflicted the injury is mad a doctor should be consulted that treatment for rabies may be

carried out without loss of time. In stings of plants and animals the sting should be removed, the part bathed with weak ammonia, and then dressed with a paste of bicarbonate of soda with water.

**CLOTHING ON FIRE.** The patient should lie down at once on the floor with the flames uppermost. The flames should then be smothered by covering them with any rug, blanket, cushion, or table-cover which may be at hand.

**ASPHYXIATION.** Both apparent drowning and asphyxiation should be treated by the immediate and sustained application of artificial respiration (*q.v.*).

**POISONING.** A message should be sent immediately to the nearest doctor explaining the nature of the case, and, if possible, giving the name of the suspected poison. The bottle or other vessel containing the suspected poison, together with any vomited material, should be kept until it has been examined. Treatment should be directed (1) to the elimination of the poison by the administration of an emetic, except in poisoning by a corrosive fluid, such as oil of vitriol, when the lips, etc., will be found to be burned; (2) towards antagonising the action of the poison by administering the appropriate antidote and giving demulcent drinks; (3) to neutralising the tendency to shock by promoting the warmth of the patient. Emetics readily obtainable are mustard, one tablespoonful in a tumbler of warm water, and salt, one or two tablespoonfuls in a tumbler of warm water. Demulcent drinks are milk, milk beaten up with eggs, cream, and any vegetable or animal oil.

**LOSS OF CONSCIOUSNESS.** All tight clothing should be loosened, and the patient put where he can obtain an ample supply of fresh air. If the face is pale the head should be placed on the ground, and the lower limbs elevated. If the face is flushed, the body should be laid flat on the ground with the head and shoulders slightly raised. In all cases the face should be inclined to one side lest vomiting occur and the vomited matter be sucked into the air-passages. No alcohol, or indeed any other liquid, should be given to an unconscious patient.

**FOREIGN BODIES.** Those in the eye may readily be removed, if on the under surface of an eyelid, by a camel's hair brush, or the moistened corner of a handkerchief. If the foreign body, however, is on the ball of the eye, and not easily removed by gentle brushing, a



drop of almond or castor oil should be dropped into the eye, and a pad of cotton wool bandaged over the eyelid in such a manner that the light pressure of the cotton wool prevents undue movements of the eyeball, until medical advice can be obtained. Foreign bodies in the nose or ear should not be interfered with by the unskilled. No attempt should be made to remove a needle unless a part of it is projecting. The part should be kept at rest, and medical advice sought. Stretchers are necessary in cases of serious illness or of certain accidents out of doors. These may be improvised by removing a door or a field gate from its hinges, or by the use of a ladder.

**REMOVAL OF CLOTHING.** Clothing should always be removed very carefully from an injured limb. It should always be first removed from the sound limb; it may be necessary also to cut away the garment on the injured side. If so, the trousers or coat-sleeve should always be cut up the outer, and not the inner, seam. A boot is best removed by cutting the lace and then the back seam; it will then fall away easily from the foot.

**First Aid Nursing Yeomanry.** Women's voluntary organization founded in 1900 as the Field Ambulance Nursing Yeomanry for service with the British Army in the S. African War. In 1907 the organization was officially recognized by the War Office and



Badge of the  
F.A.N.Y.

its title was changed. The F.A.N.Y. served throughout the First Great War, being one of the first women's organizations to go overseas, where it performed ambulance convoy work and nursing in France, Egypt, and Salonica. The corps subsequently trained as a mechanical transport unit.

In 1938 the Army Council invited its cooperation in the formation of the Auxiliary Territorial Service (*q.v.*). The unit now became the Women's Transport Service. It supplied all personnel for the first 10 driver companies of the A.T.S.; these members were called up in Sept., 1939, and went to France and one company to Finland as ambulance drivers. The unit continued to recruit for motor companies of the A.T.S. until Sept. 1, 1941. The remainder of the corps continued as a self-supporting organization with its own headquarters. Its personnel

were employed as drivers (British Red Cross Society); drivers and staff (Air ministry); drivers and canteen workers (Polish forces); telegraphists, coders, and secretaries (special forces); canteen and welfare workers (S.E.A.C. army welfare); and secretaries for the war cabinet, War office, and Foreign office. Some were parachuted into enemy territory; two were awarded the George Cross for work with the resistance movement in France. The peace-time headquarters of the corps is 55, Sloane St., London. S.W.1.

**First Army, British.** Formation of the Second Great War. The so-called "first army" landed in Algeria in Nov., 1942. When it met the Germans in Tunisia on Nov. 16 it consisted of one incomplete infantry division and one tank regiment. The division was completed on Dec. 1; the 6th armoured division was completed on Dec. 15; the 46th division reached the front in the first week of Feb., 1943, the 1st div. by March 22, the 4th div. in the second week of April. During April and May troops from the 8th army who had fought from Alamein were added to the 1st. It was commanded by Lt.-Gen. K. A. N. Anderson, and ceased to exist after fighting ended in N. Africa. (*See* Tunisia, Battle of.)

Canadian, French, and U.S. first armies fought in France and Germany during 1944-45. *See* Europe, Liberation of Western.

**Firstborn.** Technical term in the Jewish religion. In commemoration of the deliverance from Egypt, all firstborn human males were consecrated to God's service, i.e. to the priesthood, but every child that lived more than one month could be redeemed from that service. After the building of the tabernacle the tribe of Levi was appointed to the priesthood in supersession of the firstborn (Ex. 4, 13, 22, 34; Num. 3, 8, 18).

The firstlings of animals, if clean, were offered in sacrifice; if unclean, redeemed. For an ass a lamb had to be substituted, otherwise the neck of the ass had to be broken. The Jews, who are referred to as the firstborn among the nations, still solemnise the redemption of the firstborn on the 30th day after birth. In the N.T. the term firstborn is used in relation to Christ, the dead, and the Church (Col. 1; Heb. 12; Rev. 1). *See* Birthright; Passover.

**First Division.** Legal term. Until the system of divisions was abolished by the Criminal Justice

Act, 1948, the court had power to indicate to some extent the nature of the imprisonment to which a convicted person should be subjected by sentencing him to imprisonment in the first, second, or third division. Even before that Act, the power was rarely exercised and the view is now held that the exact nature of the treatment to be received by persons sent to prison should be determined by the prison commissioners and not by the courts.

**Imprisonment in the first division** was ordered mainly for persons who could not be regarded as criminals in the ordinary sense of that word; their punishment was mainly confined to loss of liberty. They were not forced to work, although if they did they earned a remission of sentence. They were kept apart from prisoners of other classes and could wear their own clothes and use their own furniture. They could obtain from outside special food and drink.

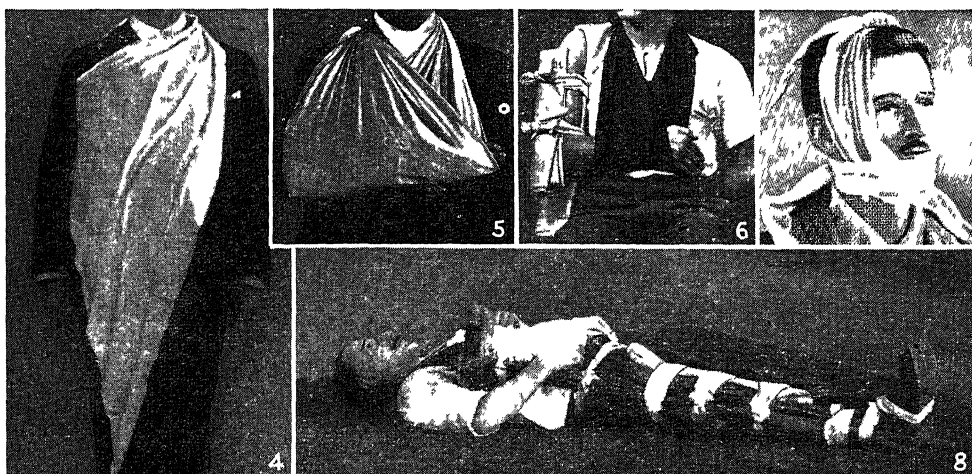
**First Empire.** Name given in France to the period between 1804 and 1814. In May, 1804, Bonaparte was made emperor, and the first republic came to an end. The empire lasted until Napoleon's abdication in April, 1814. *See* French Revolution; Napoleon.

**First Footing.** New Year's Day folk custom, especially in Scotland and the N. of England. It was regarded as unlucky for a woman or a fair-haired man to be the first visitor to any house on New Year's Day. As soon as midnight chimed people hurried to give their friends first footing, to offer them good wishes, and to partake of their hospitality. The custom may be traced back to Druid times, when the priests sent their young men from house to house bearing branches of mistletoe.

**First Fruits.** Ancient religious practice of offering to God a portion of the first fruits of a crop or the first profits of any commercial undertaking. Prescribed by the law of Moses, among the Hebrews it was usually one-sixtieth, but might be as much as one-fortieth. In the early Christian Church the practice was continued, though it was regarded as a work of devotion and not of obligation. Later it was claimed by the clergy as their due and formed part of their official income. The Apostolic Constitutions (*q.v.*) direct that the first fruits of cattle and crops should go to the clergy, and that other first fruits should be devoted to the relief of widows and orphans. *See* Annates; Tithes.



1. Pressure on the carotid artery, at the point shown, back against the spine, will arrest bleeding from a throat wound. 2. Continuous firm pressure on the femoral artery, about the middle of the groin, may save a patient from bleeding to death from a wound in the thigh. 3. Demonstrator showing how a tourniquet is improvised with a stone, bandages, and a piece of stick



4. Triangular bandage arranged for a large arm sling; the point is taken to the back of the elbow. 5. Finished sling, with point brought forward over the elbow and pinned. 6. Splint improvised from folded newspapers. 7. Fractured jaw secured by two bandages; the four ends are then tied together behind. 8. Improvised splint (broomstick) for fractured thigh. Splints must be well padded when lying against joints



Methods of carrying a patient when a stretcher is not essential. 9. How to make a four-handed seat. 10. Three-handed seat, the right arm of one bearer acting as a back support. 11. Patient being carried on a hand seat. 12. Fore-and-aft method of carrying a patient with a fractured leg

**FIRST AID: EMERGENCY METHODS WHEN EXPERT HELP IS NOT AVAILABLE**

From 1914 to 1918 most of the so-called "battles" on the western front—really the whole campaign was a prolonged battle—resulted in gains and losses of territory, entirely disproportionate to the loss of life involved, that appear insignificant on a large-scale map. Hence the operations can be simplified into five broad phases. First, there was the German maximum advance. The battles of the Marne and the Aisne, followed by the outflanking race northwards, converted this into that stabilised trench line from the sea to Switzerland which remained substantially unaltered for more than a year. Next, there were the Allied gains of 1916-17; next, the German advance in the spring of 1918; and, last, the Allied advance that ended with the Armistice. The place names and national boundaries shown on this map are those obtaining at the outbreak of the war in 1914.

**FIRST GREAT WAR: MAP OF THE WESTERN FRONT FROM SEPT., 1914 TO NOV., 1918**

# THE FIRST GREAT WAR, 1914-1918

H. W. WILSON, joint editor of *The Great War*, and GORDON STOWELL

*This is a general survey, designed for ready reference, of the main causes, events, and immediate results of the 1914-1918 world conflict, described throughout this work as the First Great War. More detailed information is given in many other articles, e.g. under the principal battles, Aisne, Marne, Somme, Tannenberg, Verdun, Ypres, Falkland Is., Jutland, etc.; under the histories of the various countries involved; and under such headings as Air Raids; Army, British; Casualty; Compulsory Military Service; Royal Air Force; Royal Navy; Sea Power; Strategy; Tank; War Memorials. See also articles on the various treaties—Brest-Litovsk, St. Germain-en-Laye, Versailles; and biographies of soldiers, sailors, and politicians*

The First Great War was the first war in history in which great nations threw into the scale their total resources of man-power and material wealth, so that the struggle was waged and endured by whole populations rather than only by armies and navies. The opponents were the Central Powers on the one hand, with Germany and Austria as the leaders, and the Allied and Associated Powers on the other, led by France, Russia, Great Britain, and (later) the U.S.A. A list of the combatants is given under Alliance (*q.v.*).

The war began with the declaration of war by Austria upon Serbia, July 28, 1914; and fighting continued until 11 a.m. of Nov. 11, 1918, when it ceased in accordance with the terms of the armistice granted by the Allied c.-in-c. to the defeated army of Germany, the last of the Central Powers left in the field.

## Casualties and Cost

The greater part of the actual fighting was waged by land armies. At the outset the armies of the combatants were mobilised to a total of over 16,000,000 men. At the end of the war the total mobilised strength in service was nearly 26,000,000. From first to last the Germans mobilised 11,000,000; Great Britain and the British Empire, over 9,000,000. Nearly 8 million combatants of all sides were killed.

The material cost of the war can be estimated only approximately. The cost to Great Britain was about £8,000 million; to Germany about the same; to France £5,000 million in addition to the enormous loss by devastation; to Italy £2,400 million; to the U.S.A. £4,200 million. As the immediate or indirect result of the war nearly £40,000,000,000 of expenditure or debt was incurred.

**CAUSES OF THE WAR.** The root causes were implicit in the course of European history during the preceding 50 years: e.g. in the rapid rise of the German empire, the development of a national desire for the ascendancy and dominance of the German race throughout the world, the economic

rivalry with and jealousy of longer-established empires entailed by this desire, and the necessity for an expanding Germany to widen her markets even at the expense of her rivals; in the resentment of France against the harsh treatment she had received after the Franco-Prussian war of 1870, and particularly against the loss of Alsace and Lorraine; in the suspicious antagonism of Russia towards the friendship of Germany for the declining Austro-Hungarian empire; in Austria's mistrust of Russian policy in the Balkans and in the Austrian fear of the aspirations of Serbia, especially after Serbia's victory in the Balkan war of 1912, and in view of her open support by Russia.

## Antagonism in Europe

The effect of these tendencies was to reduce Europe to two mutually hostile armed camps, and the increase on all sides of preparations for war only exacerbated the irritation. Various episodes during the opening decade of the 20th century served to define the precarious situation more clearly. The convention of Algeiras (*q.v.*), 1906, arising out of Germany's challenge to France over her interpretation of the Anglo-French treaty regarding Morocco, found Great Britain strongly supporting France, and led immediately to military conversations between the two countries. In 1908 the sudden annexation by Austria of Bosnia and Herzegovina (mainly because of a fear of the revival of Turkish power in the Balkans after the Young Turks revolution) was distasteful to Russia, and was not recognized by Serbia. The Agadir (*q.v.*) crisis of 1911, following the French occupation of Fez, almost marked a breaking-point, but Germany was not yet ready to counter the additional weight of Great Britain as a potential enemy. The swift increase of the German navy in the year that followed, together with such preparations as the widening of the Kiel canal to admit the passage of modern battleships, were directly aimed at neutralising this additional weight, though these activi-

ties were matched by immediate increases in British naval armament.

But by the summer of 1914, with the Kiel canal ready and Great Britain to all appearance rent by internal quarrels and the threat of civil war in Ireland, Germany no longer felt under the necessity of considering British intervention as a danger to her in case of war.

The personalities of Conrad, at the head of the armies of the Austrian empire, and Berchtold, the Austrian foreign secretary, had a direct influence on the situation, for both were, to say the least, willing to risk a general European war in their fanatical fear and hatred of Serbia and their belief in forceful measures to subdue her before she grew too strong.

The assassination of the archduke Francis Ferdinand, heir to the Austrian throne, together with his morganatic wife, at Serajevo, Bosnia, by a Serbian subject, Prinzip, on June 28, 1914, was seized upon openly by Austria and covertly by Germany as a *casus belli*. The German emperor, William II, was at that time attending the Anglo-German naval manoeuvres in the Kiel canal, but left on receipt of the news, and the manoeuvres were cancelled.

## Austrian Note to Serbia

On July 5 the emperor pressed Austria not to lose a moment which was so favourable to her, and promised to support her in the event of any move by Russia. He gave his opinion that such a move was unlikely as Russia was still unprepared for war and that France, too, would be unable to fight because of her bad financial position and her lack of heavy artillery. To Great Britain he did not allude. On July 5 and 6, after consultation with his military and naval advisers, he decided to make unostentatious preparations for war.

Austria drew up a merciless note to Serbia. It was delivered on July 23 during the period when the French president and premier were at sea, returning from Russia. On July 25 Austria broke off relations with Serbia and ordered 9 corps to

mobilise secretly, when all the ten demands in the note except two, which were referred to The Hague, had been accepted by the Serbian government, and William II himself declared that all ground for war had been removed.

**OPENING OF HOSTILITIES.** To confront Europe with the accomplished fact of war was now the plan of Berlin and Vienna. Francis Joseph was induced by falsehood (Berchtold told him that the Serbs had already opened hostilities) to sign the declaration of war with Serbia on July 28, and next day Belgrade, though an open town, was bombarded by the Austrians. Russia immediately announced (July 29) that a partial mobilisation of the Russian troops required to act against Austria would take place. This mobilisation had begun in secret on July 26, when the tenor of the Austrian note was known, and had proceeded parallel with secret preparations in Germany. Energetic efforts made by Great Britain to refer Austria's quarrel with Serbia to a conference of ambassadors were nullified by Germany.

#### Germany and Russia

On July 29 a German military council met at Potsdam, and the same day the German ambassador at St. Petersburg (Leningrad), then the capital of Russia, threatened Russia with war if she continued her partial mobilisation, which led the Russian staff later in the day secretly to order a general Russian mobilisation. The tsar answered the German threat by proposing that Austria should refer her dispute with Serbia to The Hague, a proposal which was rejected. Bethmann-Hollweg, the German chancellor, on July 29, indicated to Great Britain his intention of violating Belgian neutrality. Russia (at midnight of July 30-31) and Austria (at 1 a.m.) independently decided to proclaim general mobilisations. At noon of July 31, William II yielded to the pressure of the military party in Berlin and proclaimed a state of danger of war, automatically calling out large numbers of reservists. Late that night the German ambassador at St. Petersburg presented an ultimatum to Russia, threatening that Germany would mobilise if Russia did not demobilise in 12 hours. At 3.40 p.m. of Aug. 1, France proclaimed a general mobilisation and, independently of her action, Germany issued a similar proclamation at 5 p.m. At 7.30 p.m. Germany declared war on Russia falsely asserting that her troops had violated German territory.

The Italian government had warned Germany on July 24 that Italy's alliance had ended with the Austrian note to Serbia, and on July 31 it informed France that it would remain neutral. Great Britain, in the night of July 26, had ordered the fleet not to demobilise after the test mobilisation just carried out, and on July 29 the First Fleet left for Scotland to take up its war position.

#### German Moves to the West

At 8 p.m. of Aug. 1, German troops violated the neutrality of Luxemburg (an act of war, as this neutrality was guaranteed by France and Britain), and next day occupied Luxemburg and violated the French frontier at many points under orders from the staff. At 7 p.m. of Aug. 2, Germany delivered to Belgium her ultimatum, which had been prepared on July 26, and sent under seal to Brussels on July 29. It demanded within 12 hours permission to move German troops through Belgium on the false pretext that the French meditated an invasion of Belgian territory. At 6.45 p.m. of Aug. 3 the German government declared war on France.

Early on Aug. 4 the British government presented an ultimatum to Germany, requiring her before midnight to pledge her respect for Belgian neutrality. Bethmann-Hollweg replied that Belgian neutrality had already been violated by German forces, and complained that, "just for a word, neutrality, just for a scrap of paper, Britain was going to make war on a kindred nation." At midnight German time (11 p.m. of Aug. 4, British time), war began between Britain and Germany.

**W. FRONT—OPENING PHASE.** The German plan, in pursuit of which war was begun and Belgium invaded, was as follows: One German army (4 corps) was left in the E. to protect E. Prussia and co-operate with the Austrian forces, 600,000 strong, which were to attack Russian Poland. Austria was to move part of the armies, 500,000 strong, which she had directed against Serbia, back from the Serbian frontier to act against Russia. The main German strength was to be flung upon France and Belgium to annihilate the French armies before they could complete their mobilisation, and to reach Paris by a swift advance.

Behind this great advance reserve troops were to seize the Channel ports to prevent a British disembarkation, if the British did not act at once. To prepare for this move-

ment a German advance army was to enter Belgium and seize the junction and fortress of Liège. The Germans expected no serious resistance from Belgium, and after crushing France and dictating peace, intended to transfer the bulk of their army to the E., and then to force Russia to conclude peace. The Belgian resistance and the Russian advance into E. Prussia shattered this plan; 3 corps were detained in Belgium and at Maubeuge and 2 corps had to be sent to E. Prussia; and the absence of these corps brought the German defeat on the Marne. The German advance through Belgium was marked by many incidents of ruthless and savage cruelty towards the civilian population, which aroused the horror of the civilized world. (*See Belgium: History.*)

The French in their plans wrongly assumed that no great advance would be attempted by the Germans in W. Belgium; and that the German reserve divisions and corps would not be employed in the main attack.

As the result the Germans were able to place 1,750,000 well-equipped troops in line against French effectives of about 1,200,000 and completely to outflank the French. Yet in the French dépôts there were 1,000,000 reservists without arms or equipment.

#### B.E.F. in France

While the British expeditionary force of two corps assembled at Maubeuge, five French armies were concentrated from Mézières to Belfort. This disposition left over 100 m. of the N. frontier of France unguarded and gave no aid to Belgium.

British sea-power asserted itself at the outset, enabling the two British corps to move to France and take their place in the French line. As no aid was given to the Belgians, the Germans advanced rapidly, taking Liège and Namur. The Germans passed S. of the Belgian forces, brushing them back on Antwerp, and then swept W., moving on Brussels and Valenciennes. Other German armies passed through the Ardennes.

The principal mass of the German armies turned both flanks of the British and the 5th French army and menaced them with envelopment. They detected the German intentions and eluded the blow by swift retreat. The respite gained by this retreat of 130 m. was used to rearrange the French commands and dispositions.

Joffre, the French C.-in-C., found himself too weak to fight on

the Somme, and a further retirement was ordered. The retreat to S. of the Marne lengthened the German line of communications, exhausted the troops, and gained time for Allied reinforcements to arrive. The French government withdrew to Bordeaux on Sept. 2.

Kluck with the 1st German army had orders to protect the German right and the exposed flank of Bulow's 2nd army. On Aug. 31 in response to directions from Bulow, he began to move S.E. across the Paris front in order to aid Bulow. This movement was approved by Moltke, the German chief of staff; the British were assumed to be out of action. The German cavalry reached Ypres, Lille, Arras, and Chantilly. On Sept. 2 the German command ordered Kluck to echelon his troops behind the 2nd army. He disobeyed and continued his inward movement so as to carry out the general object, which was "to drive the French S.E. from Paris." Gallieni, the governor of Paris, detected Kluck's movement; on Sept. 4 he began to reinforce the French army N.E. of Paris with troops from the Paris garrison. Orders were issued for the general attack on the Germans which brought the first battle of the Marne (*q.v.*).

**E. FRONT—OPENING PHASE.** The German plan in the east provided for an advance into Russia, assuming that the Russian army would not be able to act for two months and trusting Austrian assertions that the Austrian forces were superior to the Russians. The Austrian staff committed the mistake of striking at once with almost equal forces on two different fronts—against Serbia and Russia. The Germans were disagreeably surprised by the rapid advance of the 1st (Rennenkampff) and 2nd (Samsonov) Russian armies into E. Prussia, though Samsonov's force had not been properly mobilised, and the movement was undertaken with grave misgivings at the request of France.

#### Battle of Tannenberg

Rennenkampff drove back the German front in a sanguinary battle at Gumbinnen (Aug. 18–20) and moved towards Königsberg, but very slowly. Samsonov, advancing with five ill-equipped corps to the S. of Rennenkampff, was attacked by Hindenburg at Tannenberg; he was killed, while the greater part of his army was destroyed because of Rennenkampff's failure to support him. The Germans turned on Rennenkampff, who escaped with heavy loss by a hasty

retreat. But this campaign, despite its disasters, forced the German staff to send two corps E. on the eve of the Marne, and took pressure off the French.

The Austrian operations were marked by utter failure. Part of the Austrian 2nd army was recalled from Serbia on Aug. 18 to assist in protecting Lemberg (Lwow), but it arrived too late. The 1st and 4th armies, advancing into Poland, gained small successes. While they were moving N. two other Russian armies, 3rd (Rusky) and 8th (Brusilov), struck at Lemberg, forced the Austrians defending that place to give battle in unfavourable conditions, and on Sept. 3 took Lemberg. The Austrians in Poland had to retire. On Sept. 6 another battle opened at Rava Russka which closed with a fresh Austrian retreat and with the loss to the Russians of all E. Galicia.

The Russians advanced towards Cracow, after taking Jaroslav (Sept. 21) and investing Przemyśl (Sept. 24); at the same time they seized the Dukla Pass in the Carpathians. Falkenhayn, who had succeeded Moltke as chief of the German staff after the Marne, fearing an Austrian collapse and the loss of Silesia (vital to the German munition industry), determined to attempt an offensive in Poland under Hindenburg, in cooperation with the shaken Austrian forces, but had to retreat (Oct. 27).

#### Struggle before Warsaw

On Nov. 4 the investment of Przemyśl was renewed, and Russian cavalry entered Silesia. Once more the plight of Austria became desperate, and, to save her, Hindenburg struck at the Russian right flank and captured Lodz, while the Russians were also checked by the Austrians before Cracow and compelled to retire towards Warsaw, before which city a fierce struggle began (Dec. 7). In Feb., 1915, the Russian 10th army suffered a repetition of Tannenberg at Augustovo, losing 100,000 men; but, as an offset to this, the Germans were repulsed at Warsaw.

On the Serbian front the Austrian operations in 1914 were disastrous. Shabatz was occupied on Aug. 16, and an advance begun on Valievo; but the Serbians attacked (Aug. 17) and completely defeated their opponents. The Austrians retreated, evacuating Serbia, but began another offensive (Sept. 8), when they were again defeated. A third Austrian offensive opened in Nov., and issued in a fresh defeat at Mt. Rudnik (Dec. 8).

**TRENCH WARFARE IN THE W.** Beaten, but not by any means routed, on the Marne, the Germans fell back on positions N. of the Aisne, which they fortified and held for nearly four years, and trench warfare began on this section of front, after the failure of the Allies in a frontal attack to make any impression. The French command endeavoured to outflank the Germans to the W. in the "race to the sea," and thus to relieve Antwerp, but it was gravely handicapped by shortage of munitions which paralysed its efforts. The British force was moved (Oct. 3–19) from the Aisne to Flanders, a necessary consequence of the decision to raise a large British army.

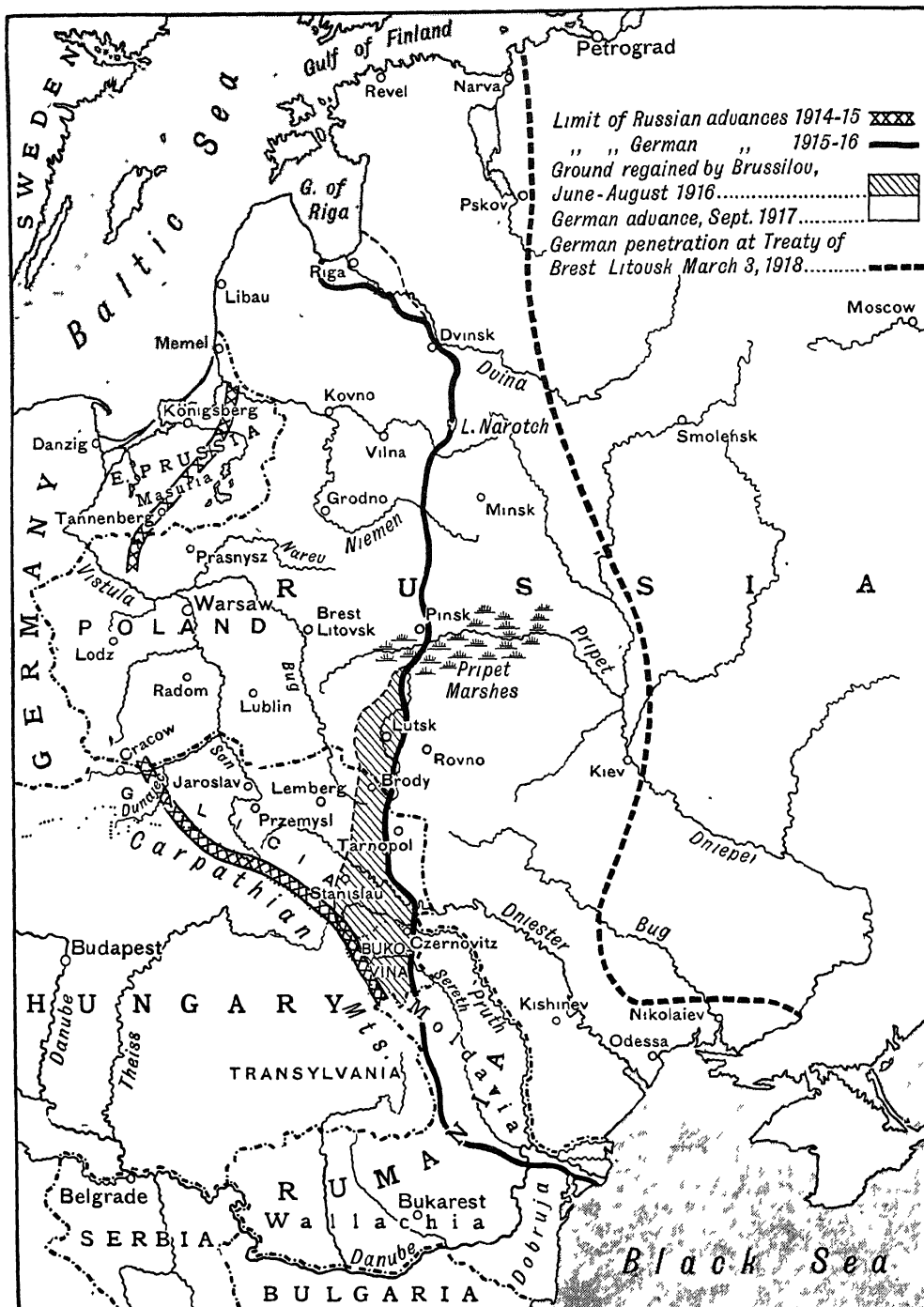
#### Fall of Antwerp

Meantime, Antwerp fell (Oct. 9), and the German staff also made a determined attempt to outflank the Allies; it extended its right and strongly reinforced it with new corps, secretly raised and trained. The British 7th division landed at Zeebrugge in early Oct., but, unable to advance in face of large German forces, it entrenched at Ypres, and there bore the first shock of a violent German attack, which it beat off with a loss of 75 p.c. of its own strength. As the Germans maintained their pressure at Ypres, more British troops, with a number of French divisions, were brought up. The battle raged along the Allied left from the sea and Ypres as far S. as Armentières, and ended on Nov. 11 in deadlock. The Germans secured Zeebrugge and Ostend, but were prevented from seizing Calais and Boulogne.

The front in the W. now extended 500 m. from the sea to Switzerland, so that it could not be turned at either extremity. This conditioned to indecisive battles until one side or other could obtain marked numerical superiority and the means of attacking machine-gun positions. The tactics of a breakthrough had to be worked out by experiment. In both Germany and France the manufacture of munitions (*q.v.*) was being pushed on a gigantic scale, but not until May, 1915, did Britain take adequate steps.

Allied attacks in the W. at Neuve Chapelle (March 10, 1915), Aubers and Festubert (May 9–16), Arras and the Champagne front, in the winter and spring, brought terrible casualties with the most trifling gain of ground. The British offensives proved that without something like unlimited supplies of high-explosive shells little could be achieved against





It should be noted that the lines on this map of the operations in the eastern area do not in most instances represent continuous battle fronts. For one thing, the trench system was never so highly developed as in the west, for another, they are intended to show limits of advance or retreat that were not necessarily contemporaneous. For instance, the advance of the Russians in E. Prussia in 1914 had been broken at Tannenberg before their maximum advance in Galicia was attained. Place names and boundaries shown here are those recognized 1914-18.

FIRST GREAT WAR: MAP SHOWING CAMPAIGNS ON THE EASTERN FRONT

the mass of German machine-guns mounted behind steel or concrete. The need to speed up production of shells led to the formation of a vigorous ministry of Munitions under D. Lloyd George.

In this period of preparation the Germans made a great attack at Ypres (April 18-May 24, 1915), memorable for the first use by them on the W. front of gas emitted from cylinders (they had already used gas shells before Warsaw with deadly effect). But for the magnificent heroism of the Canadian troops Ypres would have been lost. In the autumn a joint offensive had to be opened prematurely by the British (Loos, Sept. 25) in cooperation with the French (Arras and Champagne), with the object of relieving Russia. The gains were small, and the German front remained unbroken at the close of the year.

**OTHER FRONTS.** On the outbreak of war the German battle cruiser Goeben (*q.v.*) and light cruiser Breslau (*q.v.*), under Admiral Souchon, escaped up the Dardanelles, in violation of treaties and with the connivance of the Young Turks, who had concluded a secret alliance with Germany (Aug. 2). The defeats of the Germans and Austrians on the Marne and at Lemberg caused some hesitation on the part of the Turks, but on Oct. 29 Turkish torpedo craft bombarded Odessa without declaration and Turkey entered the war. As it was vital to protect the oilfields in W. Persia, from which the British navy obtained a large part of its fuel, a small British-Indian force landed at the head of the Persian Gulf (Nov. 21) and secured control of the Euphrates delta. The Turks attacked Russia in the Caucasus, but were defeated with a loss of 75,000 at Sarikamish (Dec. 25-28) and Kara Urgan (Jan. 10-16, 1915).

#### Gallipoli Campaign

These battles diverted Russian troops and munitions from Europe, and led the Russian government to appeal to Britain for a demonstration against the Turks. Such was the beginning of the ill-fated Gallipoli campaign, and of the dispersal of Allied forces in secondary areas. The naval attack on Turkish fortresses commanding the Dardanelles began Feb. 19 and continued until March 18. British and French troops landed on the Gallipoli peninsula on April 25. The campaign achieved nothing and the peninsula was evacuated Jan. 8-9, 1916. (*See* Dardanelles; Gallipoli.)

On May 23, 1915, Italy declared war on Austria, but her army was hampered by bad weather and want of munitions. Her forces did not press forward through the valleys, but attacked in the mountains on a narrow front, and made but insignificant progress. Yet Italy's action, coming at a moment when Russia was succumbing to defeat, diverted the attention of half a million Austrian troops. In the spring of 1915 eight fresh German divisions were sent to the E. with the object of attempting to break through the Russian front near its centre on the Dunajec and at Gorlice.

#### Allied Disasters of 1915

On Mar. 22 the Russian armies in Galicia reached the high-water mark of their advance with the capture of Przemyśl. Unfortunately, a whole Russian corps was being held ready to move against Constantinople in cooperation with the Allies at Gallipoli. A month later Hindenburg was ready. His subordinate Mackensen broke through the Russian front (April 28-May 2) at the chosen point, by means of an overwhelming artillery barrage. The Russians had neglected precautions and had no rear positions; that they escaped complete disaster was due to defective German strategy. The Germans took Warsaw (Aug. 5) and the Polish fortresses, overran all Poland, and pressed the Russians back to a line which ran from W. of Riga through Dvinsk to Tarnopol. In July, 1915, the German government attempted to induce the tsar to make peace, but the offer was rejected.

These disasters were followed by the overrunning of Serbia, in which Bulgaria joined. The Bulgarian government had signed (Sept. 6, 1915) a secret treaty of alliance with Germany, pledging itself to attack Serbia not later than Oct. 11.

**THE WAR AT SEA.** At the opening of the sea-war, the flow of supplies to Germany was somewhat impeded by the British cruisers; but as Germany had prepared for only a short conflict, the failure to institute a complete blockade was a grave mistake on the Allies' part. No such compunction was shown by the German cruisers. The German main fleet virtually withdrew from the war, leaving its submarines to prosecute a policy of attrition, but an almost "watertight" blockade of Russia was carried out by the Germans in the Baltic and the Turks in the Black Sea, with disastrous results to the Allies.

From time to time the Bight of Heligoland was swept by the British navy, and on Aug. 28, 1914, 3 German light cruisers and 1 destroyer were caught and sunk. After a period of inaction the German battle cruisers attempted a series of raids on the British E. coast, shelling Yarmouth at long range (Nov. 3, 1914), and Hartlepool, Whitby, and Scarborough (Dec. 16) on which occasion part of the British fleet had a narrow escape from the whole German force. On Jan. 24, 1915, the German battle cruisers were caught in the North Sea on the Dogger Bank (*q.v.*), and the Blücher was sunk.

German cruiser operations at the outset caused serious loss to British shipping. The only considerable German squadron at large in Aug., 1914, was von Spee's force on the China station, which included two good armoured cruisers. These sailed to S. America and off the Chilean coast destroyed Cradock's weak British squadron at Coronel (Nov. 1, 1914), but on Dec. 8 were caught by a powerful British force off the Falklands (*q.v.*) and destroyed.

Under the rules of the Declaration of London, 1909, almost all commodities vital to Germany could pass through the British cruiser lines; this Declaration had to be modified repeatedly, but it was not abandoned till July, 1916. From Feb. 18, 1915, the Germans proclaimed a submarine blockade of Britain; all vessels, including even neutrals, were liable to be sunk in a "barred zone" round the British Isles.

#### British Blockade of Germany

The British government, as a "retaliatory measure" declared (March 1) that it would prevent commodities of any kind from entering or leaving Germany. But owing to fear of neutrals, especially the U.S.A., large quantities of supplies were permitted to reach Germany. The blockade did not become watertight until 1917, after the U.S.A. had entered the war. Thus, for the first 2½ years, Germany was not subjected to the pressure which the supreme naval power, Great Britain, might have exerted.

Throughout the war the German batteries on the Belgian coast were bombarded with little result. At the Dardanelles, forts once more proved their superiority over ships. In the Black Sea and Baltic there was continual skirmishing; the Russian fleet in the Baltic acted as a drag on the activity of the German fleet and was a perpetual

menace to N. Germany. British submarines entered that sea and inflicted some loss on the Germans, though attacks on the Pommern and Moltke, which were both hit by torpedoes, did not succeed in sinking them. In the Adriatic the Austrian fleet bombarded Italy.

In 1915 the most memorable event at sea was the sinking of the *Lusitania* (*q.v.*), May 7. In 1916, the German commerce-destroyer, *Moewe*, which had escaped in 1915, inflicted considerable damage on Allied shipping. Lowestoft was bombarded by the German battle cruisers (Apr. 25), but only trifling damage was done. This affair was intended to support the Sinn Féin insurrection in Ireland which broke out on Apr. 24. The German fleet was caught at sea (May 31), and the battle of Jutland (*q.v.*) was fought with indecisive result, the Germans escaping after inflicting far heavier loss than they sustained, though they were much inferior in strength.

**WESTERN FRONT, 1916.** At the close of 1915 the German staff decided to anticipate an Allied offensive in the W. by an attack on Verdun. This struggle for Verdun, in which the determined, ruthless onslaughts of the Germans and the epic heroism of the French were each far in excess of the worth of the position to either side, especially in view of the very heavy casualties (over 300,000 on either side), opened on Feb. 21, 1916, and was not abandoned until the following December. (*See Verdun.*)

#### First Somme Battle

A joint Anglo-French offensive had been planned for the close of the summer of 1916. Haig, the British c.-in-c., favoured attack on the Yser near Ypres, where the Germans could not have fallen back without abandoning their bases on the Belgian coast. Difficulties of terrain and of co-operation with the French prevented this. It was then determined (Feb. 18) that a great attack should be delivered on both banks of the Somme. The British army was in a better position to carry out such a plan because (May, 1916), after many hesitations, the British government had imposed compulsory military service for the first time since 1815.

The attack had to be delivered earlier than had been intended, in order to relieve the French at Verdun; and the French force had to be reduced owing to the large number of men absorbed at Verdun. Opening on July 1 on a

20-mile front, it resolved itself into a series of assaults on fortified villages, each of great strength. The moral effect was marked; Falkenhayn was removed and replaced as chief of staff by Hindenburg (Aug. 29). But with continuous rain the Somme battlefield gradually became a morass. The tanks, a British invention, making their first appearance in small force with untrained crews (Sept. 15), disappointed hopes, partly because their tactics had not been worked out, partly because the terrain was unfavourable, and partly because the high command did not immediately appreciate the potentiality of the new weapon. (*See Somme; Tank.*)

**E. FRONTS in 1916.** Contrary to German wishes and without previously informing the German command, the Austrians opened a great offensive from the Trentino (May 15, 1916), advanced to Asiago, and threatened the whole Italian position in Venetia. Brusilov, commanding a group of Russian armies, opened fire on a front of 200 m. (May 31); on June 4 his infantry assaulted and broke into the Austrian front, compelling the recall of troops and guns from Italy. The Italians, when the Austrians weakened in their front, captured Gorizia (Aug. 9).

With furious energy Hindenburg reorganized the German armies and hurried reinforcements to the E. to support the demoralised Austrians, who were surrendering by the thousand. The "elastic system," or defence in depth, was ordered on the Somme, by which the Germans were to fall back slowly after inflicting the maximum of loss on the British. Brusilov entered Stanislau (Aug. 10), but already the discipline of his troops was failing; ammunition was running low; and German troops were arriving and entrenching strongly. His advance died away, after he had taken 350,000 prisoners.

#### Rumania Joins the Allies

Rumania at this juncture joined the Allies—too late. Her army, formidable on paper, lacked modern equipment and munitions. She had hesitated for many reasons—because she distrusted Russia, because her claims conflicted with those of Serbia, and because the Allies objected to her proposed strategy. The Russians wished Rumania to deliver the main attack on Bulgaria with the support of the large Allied army at Salonica. Rumania preferred to occupy Transylvania and called for an Allied offensive from Salon-

ica before she moved. This offensive Sarraïl, the Allied commander, was unwilling to promise, so long as Constantine of Greece threatened his rear. On Aug. 17, 1916, Rumania signed a military convention with the Allies by which she was to enter the war on Aug. 27–28. The Allies were unable to make any considerable advance from Salonica. All that was effected was the recovery of Monastir by the Serbians (Nov. 19), who had now re-entered the field. The Rumanians were quickly brought to a standstill in Transylvania. Bukarest fell (Dec. 6) and Wallachia, with its rich cornlands, was lost.

**NIVELLE'S OFFENSIVE.** In Dec., 1916, Joffre was replaced by Nivelle. By an Anglo-French agreement, Haig, with the British armies, was placed under Nivelle's command, and the British were required to extend their front, so as to give Nivelle troops for a great offensive which he intended. In Jan. and Feb., 1917, the British maintained their pressure, compelling the Germans to begin a considerable retreat to the Hindenburg line (*q.v.*), which Hindenburg hoped that his troops would be able to hold permanently and give time for the new "ruthless submarine campaign" to produce its effects. The Germans had fallen back to the Hindenburg line by early April, and the Allies had recovered 800 sq. m. of territory and the ruins of 100 villages and towns.

#### Arras-Vimy Offensive

Nivelle's plan provided for a great attack on the German position at Vimy Ridge by the British, who were to open the fighting in 1917, and were then immediately to transfer their offensive to Messines, previous to decisive operations against the Flanders coast, which was to be cleared to facilitate the campaign against the U-boats. The French, after the attack at Vimy had opened, were to assault the German positions on the Aisne, S. and S.E. of Laon. The Arras-Vimy offensive was carried out with extraordinary success. It opened on April 9, and might, by Ludendorff's admission, have brought the collapse of the German front and decisive victory, but for the weather. But the French attack on the Aisne (Apr. 16–20) failed (*see Aisne*), and the fighting at Arras had to be prolonged, though the British captured a large section of the Hindenburg "switch" line.

Nivelle was removed from command (May 15) and replaced by

Pétain, who was of opinion that the French army was in no position to continue a large-scale attack, in view of the mutinies which occurred about this time among certain units. It was decided to await the arrival of American troops (the U.S.A. having now entered the war) before attempting a great joint offensive against the Germans. The British arrangements had been dislocated and much time had been lost, so that the transfer of Haig's offensive to Flanders could not be carried out until weeks had passed. In April, 1917, the German staff was only with difficulty prevented from violating Dutch neutrality and seizing the mouth of the Schelde.

#### German Retreat in Flanders

To assist the French and cover the Russians, collapsing through the disintegration of the tsar's government and the outbreak of the revolution, the British steadily battered the German front. They stormed the Messines Ridge (June 7), regarded by the Germans as impregnable, with the small loss of 25,000 men. Before it was possible to renew the attack on the Ypres front the best weather of the year had gone, and the ground there had become as treacherous and difficult as that on the Somme. Over it raged a series of battles during the late summer and autumn, in which the Germans were slowly forced back with heavy loss, though the British casualties were also extremely heavy.

**THE SUBMARINE MENACE.** After Jutland there was no large-scale fighting at sea. The German light flotillas were active, raiding the Channel repeatedly, but in several of these raids they were severely handled by the Allies. In the winter of 1916 the German government decided, after long deliberation, to repudiate the promises it had given to the U.S.A. and prosecute ruthlessly its U-boat war—never really suspended. It based its decision on an assurance, given by the German admiralty, that Britain must collapse in six months or less. On Jan. 31, 1917, President Wilson was suddenly informed that Germany would close to neutrals the waters round Britain, France, and Italy, and would thenceforth observe no restraints. The American government at once broke off diplomatic relations, and when U-boats attacked and sank American ships, declared war (April 6).

The defeat of the U-boat campaign therefore became of over-

whelming importance, because it menaced the very existence of Britain (who in April, 1917, according to Admiral Sims, had only three weeks' supply of food), and threatened to prevent the armies of the U.S.A. from reaching Europe. Early in the campaign the British losses were grave, reaching a maximum in one month of 545,000 tons sunk (April, 1917), while Allied and neutral shipping suffered little less severely. But from July, 1917, the losses slowly diminished with the introduction of the convoy system and the use of new methods by the British navy and air service against the U-boats. Food was severely rationed in Britain; existing tonnage was used more effectively; new shipping was built.

The Strait of Dover was now closed to the U-boats by a barrage (*q.v.*), and a similar barrage was laid (March, 1918) across the Adriatic. Minefields were carried close in to the German bases, rendering it difficult for U-boats to pass in or out, and the Flanders bases were so constantly bombed and bombarded that U-boats were driven from them. The operations culminated in the successful sinking of blockships in the entrances to Zeebrugge (April 22–23, 1918) and Ostend (May 10). The new measures checked the U-boats and the British Admiralty was able to guarantee the safety of American troops crossing to Europe. Only 56 lives were lost through U-boat action during the movement of 1,500,000 men to France (March–Sept., 1918); and of these men 48·5 p.c. were carried in British ships.

The British naval strategy in the closing period of war was thoroughly successful. The Bight of Helgoland was heavily mined, causing a German loss of 100 vessels, and was continually patrolled by British naval forces.

#### U.S. Additions to Royal Navy

In Dec., 1917, four American dreadnoughts joined the Grand Fleet, raising its force to 51 vessels of this class against 23 German ships completed. In 1918 four more U.S. dreadnoughts were dispatched to Britain for reserve and convoy duty. So thoroughly was the inferiority of their fleet realized by the German seamen that when (Oct. 28, 1918) orders were given to it to go out and fight, the crews mutinied and thus compelled the German staff to surrender. The blockade of Germany was pressed with ever-growing severity.

The loss of British shipping during the war was 7,923,000 tons from enemy action and 1,132,000 from maritime casualties (which increased owing to the need of steaming without lights and other risks). Some part of this was made good by capture or purchase, leaving a net loss of 3,443,000 tons. The total world loss was 15,053,000 tons gross.

**THE RUSSIAN DEFEAT.** The outbreak of revolution (March 11, 1917) completed the demoralisation of Russia's armies. The fleet mutinied, and wholesale desertions on land and sea took place. A tacit truce was observed between the Russian and German forces; and all the plans prepared for Russian cooperation in the great offensives of 1917 failed just when the Austrians were making overtures for peace and the Germans were in the extremest difficulty. The whole of Galicia was swiftly recovered by the Germans, and their troops entered Podolia, a prov. of S. Russia (July 29), and proclaimed the independence of a new state, the Ukraine.

#### Treaty of Brest-Litovsk

The Germans, wanting troops for the W., did not pursue, but looked to the revolutionary extremists to do their work. They captured Riga (Sept. 3), and utilised their less efficient divisions to occupy the Ukraine, whence they hoped to draw supplies. The Russian war with Germany had virtually ceased, though a definite armistice was not signed until Dec. 15. The treaty of Brest-Litovsk with Germany and Austria was concluded on March 3, 1918.

The Russian collapse would have been fatal to the Allies had it not been delayed till a date when Britain had 5,000,000 men in service, the largest Allied army then existing. Its consequences were in part repaired by the entry of the U.S.A. into the war. But whereas Russia had large armies in contact with German territory exercising actual pressure on the Germans, the U.S.A. had no armies that counted in any part of the world. Many months were needed to train American troops and then they had to be transported to Europe. Not until Sept., 1918, did they begin to exert more than a moral influence.

#### MESOPOTAMIA AND PALESTINE

In Mesopotamia, the early British successes led to a premature movement up the Euphrates in 1915 to join hands with Russia and hold the Turks. A rash advance on Bagdad by a British-Indian force of one division was followed by a

retreat to Kut (*q.v.*). Maude was appointed to the command of the British army of Mesopotamia, and strongly reinforced from India; and at the close of 1916 he advanced and after a brilliant campaign entered Bagdad (March 11, 1917). This campaign, though a secondary one, produced considerable effect in exhausting Turkey and preparing for terrific blows which Allenby afterwards dealt her in Palestine.

#### Capture of Jerusalem

In Aug., 1916, the Turks made an attempt, their second, to invade Egypt from Palestine (then part of the Turkish empire), but were defeated at Romani, and thenceforward the British advanced slowly, constructing a railway and pipe-line for water across the desert to the Palestine frontier, capturing El Arish (Dec. 21), Rafa (Jan. 9, 1917), and reaching Gaza, where, after two days' fighting, their progress was stopped (March 26-27). A second attack on Gaza (April 19, 1917) failed. Allenby was placed in command and seized Beersheba (Oct. 31). He attacked once more at Gaza (Nov. 1-8), forcing the Turks to abandon that vital strategic point. He then worked round Jerusalem, the loss of which city (Dec. 9, 1917) was a catastrophe for the Turks. Meantime, in June, 1917, a change of importance had taken place in the Balkans. Constantine was deposed from the Greek throne, and Greece, led by Venizelos, entered the war on the side of the Allies.

**CAPORETTO AND CAMBRAI.** The Austrians on land were completely defeated by the Italians on the Isonzo (Aug., 1917). This compelled the German staff very reluctantly to strike at Italy and send 7 German divisions to the Italian front. The Italians asked for British and French reinforcements and heavy artillery; some guns were lent temporarily, but, as the Americans were not then ready to place any considerable force in line, troops could not be spared from France. The Germans broke through the Italian front near the S.E. end at Caporetto (Oct. 24); the strategic position was such that the whole force had to fall back (*see* Piave). To meet the overwhelming danger strong reinforcements were sent to Italy from the W. front (5 British and 6 French divisions). The whole of N. Venetia was lost.

The battle of Cambrai (Nov. 20), fought by Haig to lead the Germans on the W. front and support the Italians, modified the whole system of tactics and restored the element of surprise. So complete

was its initial success, attained by the advance of 400 tanks, that if fresh troops had been available to exploit the victory, the German line might have been broken finally. The opportunity could not be used; the Germans concentrated and counter-attacked (Nov. 30), recovering much lost ground.

**GERMAN OFFENSIVE OF 1918.** Owing to the collapse of Russia, the Germans were able to move all their good troops to France, where 34 divisions arrived from the E., replacing tired units and raising the total German strength in the W. to 197 divisions against an Allied strength of 169 divisions. For the first time since Sept., 1914, the Allies had no superiority in numbers. The weakest part of the Allied front was the British line between Cambrai and the Oise held by Gough's 5th army. Its S. section had been previously in the hands of the French, and had been captured during the German retreat of 1917. It had not been provided with good rear-defences, as it had been taken over only in Jan., 1918, and the supply of labour was inadequate. It was at this point that the Germans decided to make their first thrust.

The German command was now aware that the U-boat campaign had failed; and if the war was to be won, the only possible resource was to destroy the British and French armies, by severing them and rolling up the British army first. It believed that the French troops were tired and that the morale of the British had been shaken by propaganda behind the line. The actual attack opened on March 21, 1918, by which time Foch had been appointed supreme commander of the Allies in the W.

#### "Backs to the Wall"

On April 9 the Germans attacked at Armentières, driving a deep wedge, which they steadily widened, into the British front. They captured the Messines Ridge, thus imperilling the British position at Ypres and the defence system of the Channel ports. They took Kemmel Hill (April 25) from the French. The position could scarcely have been more critical. It was on April 11 that Haig (*q.v.*) issued his "backs to the wall" order, and the troops responded with surpassing spirit. Again the German attack died down.

During this offensive the Germans made slight gains near Amiens which brought them within 7 miles of that vital point and enabled them to keep the main

railway to Paris under constant fire. But the Australians beat off all further attacks and even won some ground.

The Germans renewed their attack on May 27, when with 25 divisions they attacked 4 weak British and 4 tired French divisions on the Aisne, between Soissons and Reims, and reached the Marne once more on a front of 10 m. E. from Château-Thierry. Extending this advance, they gained a point only 45 m. from Paris, which city they had bombarded from March 23 onwards with special long-range guns installed near Laon and firing at a distance of 70 m. At the same time they carried out large-scale air raids on Paris.

#### Turn of the Tide

Early in June, Foch had to effect withdrawals between Montdidier and Château-Thierry before German pressure, but though the Germans appeared on the eve of success, on June 13-14 they were stopped. This was in reality the passing of the crisis, and the Allies had now a slight numerical advantage. On July 2 the American government announced that a million Americans had already sailed for Europe, so that Germany had not a moment to lose.

The German front at this moment formed a vast semi-circle, bulging into the Allied front, so that the German staff could strike at any point and hold their reserves in a central position which would not betray their intentions. Foch, however, obtained accurate information as to the place and date of the intended offensive, and took admirable measures to meet it. Delayed by stormy weather, it was not until July 15 that the Germans advanced.

For the second time in the war the Marne proved itself a river of fate; the Germans crossed it, but were heavily repulsed at Reims, and S. of the Marne they were quickly brought to a standstill N.W. of Épernay. This was the high-water mark of their advance. By July 16 the German staff knew that the attack had failed.

**FINAL BATTLES.** Foch's preparations for a return stroke were complete. Early on July 18, French and American divisions delivered a sudden attack on the exposed German flank between the Aisne and Château-Thierry. They forced a German retreat across the Marne. Foch pressed the Germans continually, and drove them steadily, if slowly, back, while French, British, American, and Italian

troops attacked on both sides of the Marne salient, and endeavoured to hold the enemy and pinch him off.

The German reverse on the Marne had great effect in shaking Austrian and Bulgarian confidence, and on Aug. 3 the German staff admitted "our strategical plan of attack had failed."

On Aug. 8, Haig and the British, with the 1st French army co-operating, attacked before Amiens, employing 400 tanks. The Germans were completely surprised, and 6 or 7 German divisions of high quality were destroyed, and the severest defeat of the whole war up to that date was inflicted on the German army. Montdidier was retaken by the 3rd French army, which attacked when the Germans elsewhere gave way.

The British "Hundred-Days' Battle" had begun. From Aug. 8 Haig maintained his persistent assault on the German front with only the briefest intervals for the repair of the railways and roads. Such attack was made possible because of the unity of command and the abundant supply of munitions now at his disposal.

#### Germany's Desperate Efforts

Ludendorff pressed both Austria and Bulgaria to send reinforcements to the W. front. Bulgaria refused, and Austria could be induced only to send artillery and to promise a few divisions, which were speedily engulfed in the general disaster. All the difficulties of the German staff were accentuated by a brilliant attack delivered by the French between Noyon and Soissons (Aug. 20). The British pressed their advantage, attacking with equal violence on the old Somme front, and retaking Albert. On Aug. 21-26 they attacked and captured the important positions abutting on the N. end of the advanced Hindenburg (or Wotan) line, near Arras.

The Wotan line itself was stormed by Canadian and British troops (Sept. 2). The Germans were flung back on the main Hindenburg line of fortifications before Cambrai, which were of extraordinary strength, and had the advantage of water-protection in their front as a security against tanks. The German armies were showing signs of exhaustion, and Ludendorff bitterly complained that he was not properly supported by the civilians in the government.

At this juncture the Americans under Pershing began their first large scale operation (Sept. 12), and captured the deep salient in

the Allied front at St. Mihiel, and cleared the great Paris-Avicourt double-track railway which Foch wanted for the development of his manoeuvres. Simultaneously the British closed upon Cambrai and made ready to assault the enormous Hindenburg works, and to force the defences of that pivotal point and junction.

This was the gravest operation of the whole Allied offensive, and there were many doubts as to whether it could succeed, such were the natural and man-made obstacles. The prelude was the opening of a great American offensive on both sides of Verdun, through the Argonne region of forest, hills, and swamps, a terrain of the greatest difficulty, rendered more difficult than ever by heavy rains. The French supported this offensive by an attack W. of the Argonne, so that the Germans were held firmly.

Covered by an unexampled concentration of 4,200 guns, the British began the storming of the Hindenburg line. The Canal du Nord was crossed (Sept. 27), and the British pushed clean through the Hindenburg line near its N. end. On Sept. 28 the battle-front was prolonged by an Allied advance in Flanders which captured the Messines ridge, cleared Ypres, and resulted also in a great gain of ground. On Sept. 29 the British crossed the St. Quentin canal (S. of Le Catelet), and broke the Hindenburg system S. of Cambrai; the same day the Canadians fought their way into the suburbs of Cambrai.

#### Bulgaria Sues for Armistice

Meanwhile, on Sept. 15 the Allies on the Salonica front attacked the Bulgarians N. of Monastir. The Serbians broke right through the Bulgarian front, while the British and Greeks pinned down the forces before them, in the immediate N. of Salonica. Owing to the dash and determination of the Serbians the victory became a decisive one (Sept. 21).

On Sept. 26 the Bulgarian government asked for an armistice, which was signed on Sept. 29. The news of this surrender caused financial panic in Germany, as with it railway communication between Germany and Turkey was cut and the fall of Turkey at an early date assured. Rumania had been compelled by the defection of Russia to sign an armistice with Germany (Dec., 1917), followed by a definite peace. Throughout early 1918 the Austrian emperor Charles had been anxious for peace owing to grow-

ing internal difficulties and want of food. In June, to obtain supplies which the Germans would grant on no other conditions, he was forced to undertake an offensive in Italy. The support of 100,000 German troops had originally been promised him by Ludendorff, but owing to the failure of the earlier German offensives in France to secure decisive results, they could not be sent.

#### Austria and Turkey Collapse

On Sept. 15 the Austrian emperor issued a peace note, which the Allies rejected, and orders were issued for a great Italian offensive. The battle of Vittorio Veneto (*q.v.*) ended the Austrian resistance, and on the night of Nov. 3 the Austrians signed an armistice. The surrender of Turkey preceded that of Austria by a few days.

On Oct. 1 Ludendorff urged the German government to open negotiations for an armistice in the W. as quickly as possible. The civilians of the German government thought he had lost his nerve completely, but many other officers at the German headquarters shared his view. Prince Max of Baden was appointed chancellor and attempted to open negotiations with President Wilson, on the basis of his Fourteen Points (*q.v.*) set forth in Jan., 1918.

The British continued their advance. On Oct. 8 they opened the battle of Le Cateau, and captured Cambrai on the following day. The whole German line tottered; Laon, a vital junction, fell to the French (Oct. 13); Roulers, in Flanders, was taken on Oct. 14, and Menin on the following day. In danger of envelopment, the Germans abandoned the Flanders coast, and the Allies occupied Ostend (Oct. 17) and Zeebrugge (Oct. 19). The Germans had to evacuate Lille and Douai on Oct. 17, and the Allies recovered Tourcoing and Roubaix next day. On Oct 17 the British broke through the German front on the Selle. On Nov. 1 they opened the battle of the Sambre, which brought the recovery of Valenciennes and an advance over the old battlefield of Mons. That place was captured, and passed by the British just as the armistice came into force (Nov. 11).

Meantime, the French had pushed forward on the section of front between the main British attack and the American Argonne advance. The Americans pressed N., threatening more and more the German line of retreat. They took Stenay (Nov. 4), and continued their



progress till they reached the suburbs of Sedan.

Germany now knew she was beaten—not only in the military field but by the severe pressure of the Allied blockade, which crippled her production. In the long struggle of attrition by exhaustion of man-power, she was faced with the prospect of meeting the new and vigorous reserves of man-power from the U.S.A., as yet scarcely tapped. The inescapable facts were pressed home by intensive British propaganda.

To obtain peace, the German government on Oct. 20 ordered its U-boats to cease attacking passenger ships; it was warned by President Wilson (Oct. 23) that the only possible armistice would be one rendering a renewal of the war out of the question, and that the Allies could never trust William II. The American president had previously referred the Germans to the Allied military advisers for the conditions. Ludendorff resigned on Oct. 27. On Nov. 7, revolutionaries seized Kiel and Hamburg, and German delegates left for Foch's headquarters to negotiate the terms of the armistice. When informed of the conditions settled for them, they protested vehemently, but their Government on Nov. 10 announced by wireless its acceptance. William II had abdicated under pressure on Nov. 9; he fled to Holland, accompanied by the crown prince.

#### Conditions of the Armistice

The main condition of the armistice (signed 5 a.m., Nov. 11) were: Cessation of operations six hours from signature. Evacuation within 15 days of Belgium, France, Alsace-Lorraine, and Luxemburg by all German forces. Repatriation of all prisoners and civilians taken by the Germans. Surrender by them of 2,500 heavy and 2,500 field guns, 25,000 machine-guns, 3,000 mine-throwers, and 1,700 aeroplanes, including all night-bombing machines. Evacuation by the Germans and occupation by the Allies of all German territory W. of the Rhine, with, in addition, bridgeheads of 20 m. radius on the E. bank of the Rhine at Cologne, Coblenz, and Mainz, to which other bridgeheads at Kehl (opposite Strasbourg) and Mannheim were afterwards added. Surrender of 5,000 engines, 150,000 wagons, and 5,000 motor-lorries.

Reparation for damage done to be paid, "all future claims and demands of the Allies remaining unaffected." All submarines to be

surrendered. Six battle cruisers, 10 battleships, 8 light cruisers, and 50 destroyers to be interned under Allied surveillance, and all other German warships to be disarmed. The blockade to continue till definite peace; German minefields to be removed; all naval aircraft to be immobilised. All territory outside Germany to be evacuated. The duration of the armistice, for 36 days in the first place, was repeatedly extended—until the treaty of Versailles was signed (June 28, 1919). On Nov. 21, 1918, the German surface ships arrived at Rosyth for internment; their crews scuttled most of them at Scapa on June 21, 1919.

The confusion in the German rear was great; transport and supply were breaking down; roads were choked; troops were deserting; losses in men and material had been irreparable. All the German monarchies had fallen. Foch's forces when the armistice was signed held a line E. of Ghent, Mons, Maubeuge, and Hirson, thence turning S.E. through Mézières, Sedan, Stenay, and Ornes to S. of Metz.

**THE AIR WAR.** The bombing attacks by Zeppelins and aeroplanes upon the civilian populations of British and French cities throughout the war are described in the article Air Raids, as are the later raids made on industrial centres in Germany by Allied aircraft. In Great Britain the Zeppelin arm was met and broken in the autumn of 1916, but the menace from the aeroplane developed steadily. As the British government refused, until late in 1917, to carry out reprisals, the Germans derived great advantage from this air war. They neutralised and held fast in England some 100,000 men with large numbers of machines, absorbed in defence. The importance of air warfare grew daily and was felt at Arras and Messines, where the British airmen carried all before them; but the Germans maintained a determined competition to the end. (*See* Royal Air Force; Royal Flying Corps.)

**THE GERMAN COLONIES.** The German colonies were attacked early in the war, and one after another were captured, though not without severe fighting in some cases. The German fortress of Tsingtau (Kiao-chau), on the E. coast of China, was captured by a Japanese expedition, aided by a small British contingent, on Nov. 7, 1914. Japan had declared war on Germany (Aug. 23, 1914)

and cooperated in the convoy of British forces to Europe and in the cruiser operations in the Pacific and Indian Oceans against von Spee and the Emden, but she took little further part in the war, beyond sending a number of destroyers to the Mediterranean, where they did excellent work against the U-boats. She occupied the Caroline and Marshall Islands in the Pacific. Samoa was seized by New Zealand troops, and German New Guinea and adjacent islands by Australian troops, aided by the Australian navy.

#### Germany's African Possessions

Of the vast German territories in Africa, Togoland was conquered by the British and French in 1914 and was divided between them. Cameroons was occupied by British and French forces in 1916. German South-West Africa, one of the most valuable of the German colonies, equipped for a base against the Union, was reduced by Botha and Smuts in a remarkable campaign which closed July 9, 1915. South-West Africa was thenceforward administered by the Union of South Africa.

In German East Africa, owing to the great extent of territory, the destruction of the German forces was difficult. British, Belgian, and Portuguese forces cooperated, and by the close of 1916 the coast and central railway to Tanganyika were in Allied hands. But the war smouldered on, though the German forces were small, and at the armistice there were still about 1,500 German and native troops in arms.

**THE BRITISH CAMPAIGNS.** The burdens supported by the British and the services they rendered to the Allies will best be understood from the official list of 26 campaigns in which British troops took part, issued by the Army Council. They were: France and Flanders, 1914-18; Italy, 1917-18; Macedonia, 1915-18; Dardanelles, 1915; Sudan, 1916; W. Egypt, 1915-16; E. Egypt and Palestine, 1914-18; Hejaz, 1916-18; S. Arabia, 1914-18; Mesopotamia, 1914-18; S. Persia, 1915-19; E. Persia, 1915-19; N.W. Persia and Caspian, 1918; N.W. India, 1914-18; Murmansk, 1918-19; Archangel, 1918-19; Siberia, 1918-19; China, 1914; Australasia, 1914; E. Africa, 1914-18; S.W. Africa, 1914-15; Togo, 1914; French W. Africa, 1917; Cameroons, 1914-16.

**RESETTLEMENT OF EUROPE.** The treaties which formally ended the war were those of Versailles,

concluding peace with Germany, June 28, 1919, ratified Jan. 10, 1920; St. Germain-en-Laye, with Austria, Sept. 10, 1919, ratified July, 1920; the Trianon, with Hungary, June 20, 1920, ratified a year later; Neuilly, with Bulgaria, Nov. 27, 1919; and Sévres, with Turkey—though this last was never operative, being signed at Constantinople in Aug., 1920, by a Turkish government with no real authority; it was superseded by the treaty of Lausanne, July 24, 1923. These treaties are dealt with in greater detail under their own headings.

#### Europe after the War

The Versailles treaty established the League of Nations (*q.v.*), which for the next 20 years was to exert a varying weight of influence on the direction of international affairs. The German empire of the Hohenzollerns collapsed, as did the Austro-Hungarian empire of the Hapsburgs. Germany became a republic. She lost all her overseas colonies, mostly to Great Britain and France, returned Alsace and Lorraine to France, and underwent several modifications of her boundaries in favour of Belgium, Lithuania, and reborn Poland. Austria and Hungary became two states, each republican in form. The area of Austria was greatly diminished by the cession of territory to Italy and to the new states of Czecho-Slovakia and Yugoslavia, created in pursuance of Wilson's policy of the right of self-determination. The old kingdom of Poland re-emerged as an independent republic, with a "corridor" to the Baltic. The defeated Russian empire was rent by violent revolution and had ceased for the time being to hold any place in world councils. Her break-up permitted the establishment of the four Baltic independent republics of Finland, Latvia, Lithuania, and Estonia.

Great Britain emerged from the struggle stronger in prestige and power. At the close of the war she had by far the strongest, best trained, and best equipped army in the field. The status of the British dominions was enhanced by their great contribution to the result, each receiving separate representation in the League of Nations, but the links binding them to the British crown were seen to be more firmly re-forged in the common endeavour. Palestine and Iraq were placed under British mandate by the League.

As already indicated, the financial loss entailed by the combat-

ants was unprecedented. Currency values throughout the world were deeply affected, depreciating in some countries with tragic swiftness. But more serious, because irremediable, was the loss to the world of 8,000,000 of its young manhood. In addition, large centres of population in central Europe were on the verge of starvation. Less easy to assess was the depreciation in moral and philosophical values, as seen in a wider substitution of cynicism and opportunism for the older ideals which had been based on a firm belief in human progress. Not only had the German aggression and wanton breaking of faith revealed the frailty of such influences as make for a higher form of civilization; but the length of the war, and its unprecedented horrors and squalors, had brought about a vast sense of disillusionment and an exhaustion of mental and moral effort, tending too often to a mood encouraging inertia. These tendencies were to cloud and hamper the world's activities for many years.

**Bibliography.** War Books: a Critical Guide, C. Falls, 1930, is a useful guide to the vast literature of the First Great War, but is incomplete in that it does not include books on the causes of the war or on the peace-making; moreover, many books, including at least one of the first importance, have been published since 1930. It has been stated that the British Museum library catalogue contains as many items on the First Great War as on the Holy Bible.

The British Official Histories, issued by the Imperial Defence Committee, fill many volumes, some of which had not been published even by 1947. They cover military operations in Egypt and Palestine (2 vols.), France and Belgium (14 vols.), Gallipoli (2 vols.), E. Africa, Mesopotamia (4 vols.), Togoland, and Italy; histories of all the divisions of the British army in the war (6 vols.), naval operations (5 vols.), the merchant navy (3 vols.), seaborne trade (3 vols.), air warfare (6 vols.); and medical services, etc. (12 vols.).

Other general historical surveys include Short History of the Great War, A. F. Pollard, 1920; Outline History of the War, G. V. Carey and H. S. Scott, 1928; Popular History of the Great War, 6 vols., ed. J. A. Hammerton, 1934. A history published during the war, and therefore subject to stringent censorship, yet valuable for its contemporary standpoint, is The Great War, ed. H. W. Wilson and J. A. Hammerton.

British Documents on the Origins of the War, ed. G. P. Gooch and H. W. V. Temperley, 11 vols., 1928-38, is an outstanding and

authoritative publication. Temperley's History of the Peace Conference, 1920-21, is a standard work.

More personal narratives, though each indispensable to full appreciation of the subject, are The World Crisis, W. S. Churchill, 6 vols., 1923-30, and War Memoirs, D. Lloyd George, 6 vols., 1933-36; also The Truth about the Peace Treaties, D. Lloyd George, 1938. Leading figures who contributed their memoirs were Lord French (1919), Lord Jellicoe (1919), Falkenhayn (trs. 1919), Ludendorff (trs. 1919), Tirpitz (trs. 1919), Hindenburg (trs. 1920), Kluck (trs. 1920), Scheer (trs. 1920), Townshend (1920), Robertson (1921), the ex-Kaiser (trs. 1923), Masaryk (trs. 1927), Benes (trs. 1928), Prince Max of Baden (trs. 1928), Poincaré (trs. 1928).

Among innumerable other books of record and reminiscence may be mentioned The First World War, C. & C. Repington, 2 vols., 1920; Tanks in the Great War, J. F. C. Fuller, 1920; A Naval History of the War, Sir H. Newbolt, 1920; With the Russian Army, Sir A. Knox, 1921; Personalities and Reminiscences, R. L. Bullard, 1925; The Intimate Papers of Col. House, ed. S. Seymour, 4 vols., 1926-28; Gallipoli, J. Masfield, 1926 edn.; Revolt in the Desert, T. E. Lawrence, 1927; My Mystery Ships, G. Campbell, 1928; Haig, Duff Cooper, 2 vols., 1935-36.

More philosophical or psychological in their study of individual human reaction to the war are such "literary" books as A Private in the Guards, S. Graham, 1919; Realities of War, Sir P. Gibbs, 1920; Disenchantment, C. E. Montague, 1922; Undertones of War, E. Blunden, 1928; The Weary Road, C. Douie, 1929; War Letters to a Wife, R. Feilding, 1929; Memoirs of an Infantry Officer, S. Sassoon, 1929.

The following novels dealing with the war may be cited as "documents" of some value: Mr. Britling Sees It Through, H. G. Wells, 1916; Under Fire, H. Barbusse, trs. 1918; The Secret Battle, A. P. Herbert, 1919; The Four Horsemen of the Apocalypse, V. Blasco Ibañez, trs. 1918; The Barber of Putney, J. B. Morton, 1919; Command, W. M'Fee, 1922; Some Do Not (1924), No More Parades (1925), A Man Could Stand Up (1926), and Last Post (1928), all by F. Madox Ford; The Spanish Farm Trilogy, R. H. Mottram, 1924-26; These Men Thy Friends, E. Thompson, 1927; The Case of Sergeant Grischa, A. Zweig, trs. 1928; War, L. Renn, trs. 1929; All Quiet on the Western Front, E. M. Remarque, 1929; Class 1902, E. Glaeser, trs. 1929; Her Privates We, "Pte. 1902," 1930; All Our Yesterdays, H. M. Tomlinson, 1930; The Patriot's Progress, H. Williamson, 1930. The "soul of the war" is also revealed in the works of various soldier-poets, e.g. Blunden, Grenfell, Hodgson, Nichols, Owen, and Sassoon, as it

is in the paintings of such artists as Orpen, Nevinson, John and Paul Nash, Kennington, H. S. Williamson, and many others whose work is exhibited in the Imperial War Museum, London.

A remarkable phenomenon was the sudden vogue in Great Britain for books about the war, especially fiction, in 1929-30, until the public was surfeited and the demand and supply ceased as suddenly as they began. It was the more strange in view of the unpopularity of the same subject during the preceding ten years, although a few outstanding war novels had appeared, only to be neglected. The change in taste was due in part to the success on the London stage of R. C. Sherriff's war play *Journey's End*, and in part to the extensive advertisement given in 1929 to E. M. Remarque's *All Quiet on the Western Front*, which sold extravagantly. Very little of the flood of war books which followed merited permanence.

**First Offender.** A legal term. In England at common law there was always jurisdiction to bind over any offender to be of good behaviour. But since many magistrates seemed to ignore this, the First Offenders Act, 1887, was passed, giving all courts of criminal jurisdiction power to bind over first offenders instead of punishing them. The Probation of Offenders Act, 1907, extended this power to all cases, whether first offences or not; and gave the court power to order any first offender to be placed under the supervision of some person named (generally the probation officer) for a period. The order may also provide that the offender shall abstain from intoxicating liquor, and may prescribe conditions as to his residence. See *Borstal System*; *Children*.

**First of June, BATTLE OF.** Fought in 1794, the first great naval action in the War of the French Revolution. France, though victorious on land, was in a situation little short of desperate. It was the epoch of the Terror, the harvest of the previous year had been poor, and famine was threatened. The British blockade was crippling supply. The Committee of Public Safety had endeavoured to relieve the situation by purchasing grain in the U.S.A., and a convoy of 116 vessels was dispatched, which approached the French coast towards the end of May. Rear-Admiral Nielly was sent out to meet the convoy, which Lord Howe was instructed to intercept.

The main French fleet, under Admiral Villaret-Joyeuse, left Brest on May 16 to cover the

arrival of the great grain convoy, and it was not until the 28th that Howe sighted his adversary. A good deal of fighting preceded the great action of June 1, in which Howe's fleet was shown to be the superior fighting force. His plan was to attack the enemy in line, van to van, centre to centre, and rear to rear, to break through the opposing line, and fight to a finish on the lee side. His ships were to pass through the intervals in the French line, but approach was slow, and the order could not be completely executed.

The *Bellerophon*, Russell, Royal Sovereign, and other ships attacked to windward, and several French ships thus slipped or were driven away. The Marlborough and Queen Charlotte (Howe's flagship), broke through the line, and delivered their broadsides with shattering fire. Captain Harvey, in the Brunswick, endeavoured to drive through the French line, but brave Captain Renaudin, in the *Vengeur*, stopped his way and the two ships were locked together in a furious struggle which has become famous, until the *Vengeur*, swept and broken by fire, went down with all her company. At every point the action was fought with the utmost gallantry and resolution on both sides. Six prizes remained in English hands, and the success, if not decisive, was enough. For two years to follow there was no great action at sea. The French, too, claimed a victory, for their fleet had not been destroyed, and their convoy reached Brest in safety.

**First Republic.** Name given in France to the period from 1792 to 1804. On Sept. 21, 1792, the convention declared the monarchy at an end and the country a republic. This lasted until May, 1804, when Bonaparte was declared emperor. See *French Revolution*; *Napoleon*.

**Firth.** Name given to a narrow inlet or arm of the sea found on the coasts of Scotland. Most of them are estuaries or gulfs into which rivers discharge themselves, e.g. firths of Clyde, Tay, and Forth, but Pentland Firth is a broad strait or channel. Firths are, as a rule, valleys which have been flooded by the sea.

**Firth, SIR CHARLES HARDING** (1857-1936). A British historian. Born in Sheffield, March 16, 1857, he was educated at Clifton and Balliol College, Oxford. He became fellow of All Souls, 1901, and was chosen in 1904 to succeed York Powell as regius professor of modern history at Oxford. He

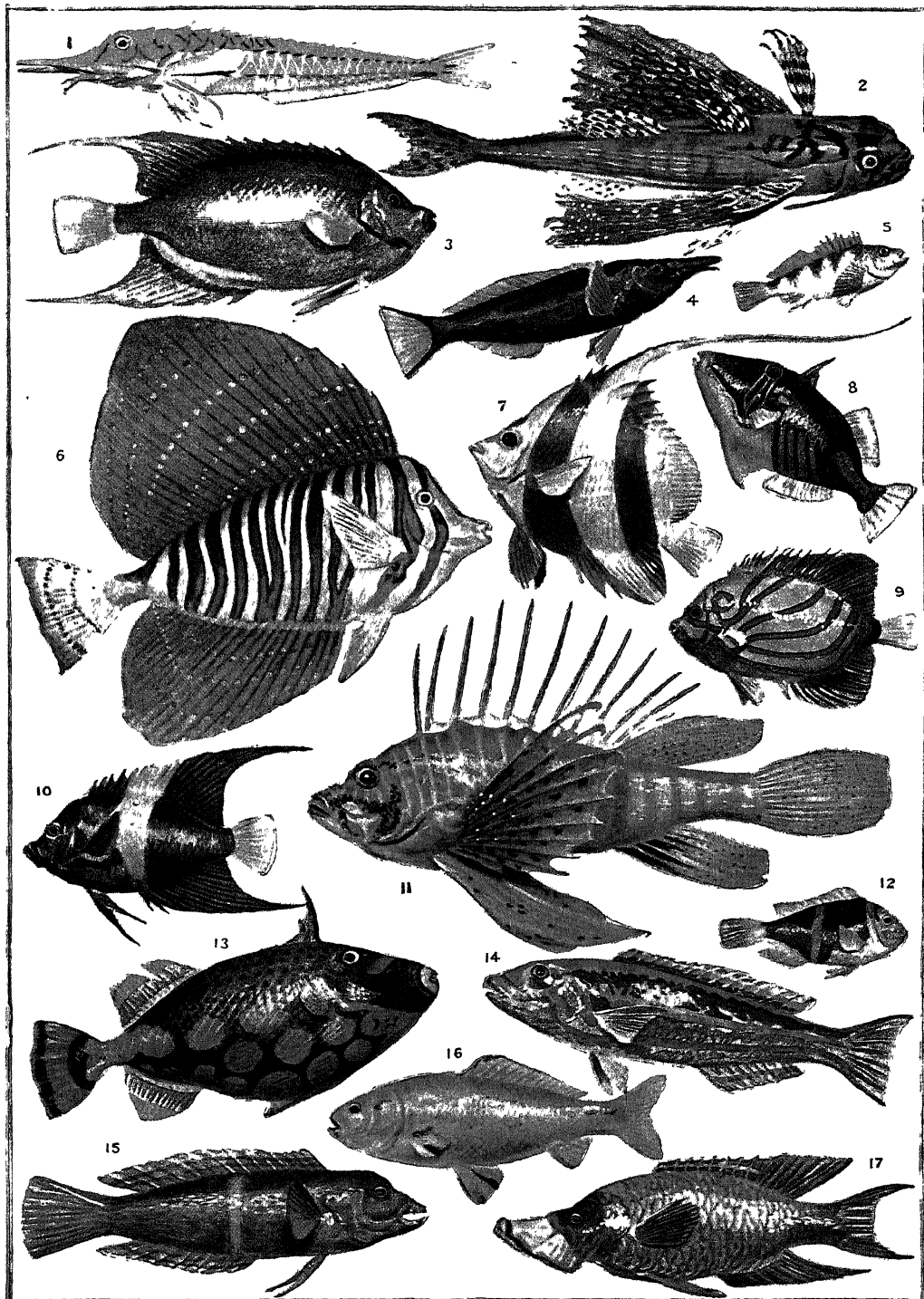
edited Ludlow's *Memoirs*, 1894, The Clarke Papers, and The *Memoirs of Colonel Hutchinson*; wrote monographs on Cromwell, 1900; Cromwell's Army, 1902; and continued S. R. Gardiner's unfinished history of the Commonwealth and Protectorate. Firth's work threw much light on the middle decades of the 17th century. He was knighted 1922, retired 1925, and died Feb. 19, 1936.

**Firth, MARK** (1819-80). British manufacturer. Born at Sheffield, April 25, 1819, he was the son of an artisan in the steel industry. In 1843 his father, brother, and himself together opened a steel furnace. Mark was the moving spirit of this enterprise, and soon made it one of the largest concerns in Sheffield. The Norfolk Works were built to cope with the increasing business, while others were erected outside the city. Firth died Nov. 28, 1880. Known as a philanthropist, he built almshouses at Rammoor, and founded Firth College, the nucleus of the university of Sheffield.

**Fisc** (Lat. *fiscus*, treasure chest). Term used in England in the Middle Ages for what is now the treasury, the account into which the public revenues are paid. From it comes the more familiar word *fiscal*. See *Fiscus*.

**Fischart, JOHANN** (c. 1545-90). German satirist. He was born in Alsace, and studied at Worms. He travelled in Holland, England, France, and Italy, and studied law in Strasbourg; he had already published lampoons and satires against the Jesuits and others, and a free rendering of Gargantua into German, 1575, when he was appointed magistrate at Forbach, near Saarbrücken, 1583. Under various pen names, Fischart did good service to the Lutheran movement. The best known of his reprinted works is the simple verse narrative *Das Glückshaff Schiff von Zurich* (The Lucky Boat of Zürich), 1576.

**Fischer.** Name of several German scientists. Emil (1852-1919), born Oct. 9, 1852, was awarded the Nobel prize for chemistry in 1902. His main work was in the preparation of synthetic sugars and research into problems of fermentation; he discovered the soporific veronal; his attention to nitrogen compounds was given at a time when German sources of munitions were failing. He died July 15, 1919. Eugen, born June 5, 1874, became director of the Kaiser Wilhelm Institute for anthropology and eugenics. Franz, born March 19, 1877, was part-inventor of the

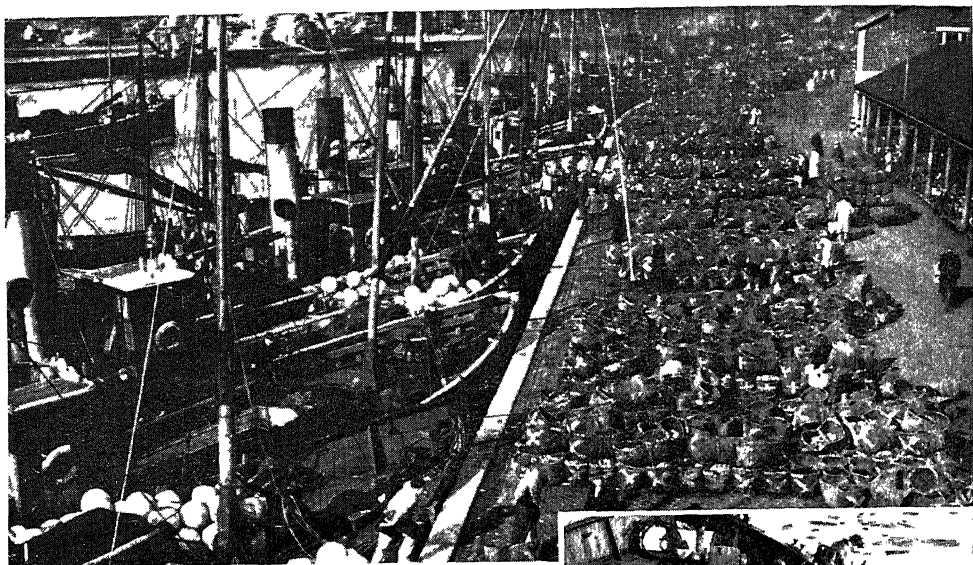


1 *Peristedion cataphractum*, European seas 2 *Dactylopterus volitans*, Mediterranean and tropical Atlantic 3 *Holocanthus illaris*, Atlantic coasts of tropical America 4 *Gomphosus coeruleus*, Indian Ocean 5 *Carinatus carinatus*, Indian Ocean and West Pacific 6 *Acanthurus veliei*, Polynesia 7 *Hemiochilus macrolepidotus*, Indian Ocean and Malay Archipelago 8 *Balistes aculeatus*, tropical seas 9 *Holocanthus annu-*

*latus*, Malay Archipelago 10 *Holocanthus asini*, Red Sea 11 *Pterois miles*, Red Sea and Indian Ocean 12 *Amphiprion chrysoanctus*, Indian Ocean 13 *Balistes conspicillum*, Indian and Pacific Oceans 14 *Julis tulokata* and 15 *Coris aygula*, Red Sea Indian and West Pacific Oceans 16 *Cyprinus auratus*, China Sea 17 *Lipibulus insidiator*, Indian Ocean and Malay Archipelago

# **FISH: VIVIDLY COLOURED SPECIES. HABITANTS OF MANY SEAS**

*Specially drawn to approximately one sixth natural size, by J. I. Campbell*



1. Fishing fleet at the quayside, Yarmouth, showing carrier baskets used in unloading the boats 2 East Anglian fishermen casting their nets 3 Hauling a

catch of herrings aboard a drifter 4 Unloading a fish carrier at the quay 5 Packing fish for distribution to the various home markets. See text pp 338-4

**FISHERIES: ACTIVITIES IN THE WORK OF THE NORTH SEA FISHING FLEET**

Fischer-Tropsch process (*q.v.*) for gasifying coal. Hans, born July 27, 1881, became professor of chemistry at Innsbruck, Vienna, and Munich, and on being the first to prepare haemoglobin synthetically was awarded the Nobel prize for chemistry in 1930.

**Fischer, JOHANN GEORG VON** (1816-97). A German poet and dramatist. He was born Oct. 25, 1816, at Gross-Sussen, Wurttemberg. Having studied botany and literature at Tubingen, he was in 1846 appointed professor at the Stuttgart Oberrealschule. In 1854 he published his first volume of poems, and in 1896 his last, *Mit Achtzig Jahren* (In my Eightieth Year). He also published some dramas, notably *Saul*, 1862; and *Kaiser Maximilian von Mexiko*, 1868. His lyric poetry is characterised by natural beauty and exalted tone. He died at Stuttgart, May 4, 1897.

**Fischer, KUNO** (1824-1907). German philosophical writer. Born at Sandewalde, Silesia, July 23, 1824, after studying at Leipzig and Halle he became a tutor at Heidelberg, but owing to his advanced ideas was compelled to discontinue his lectures. For 16 years he was professor at Jena, and in 1872 succeeded Zeller as professor of philosophy at Heidelberg, where he died, July 4, 1907. A modified Hegelian in his views, he did much to popularise Kant. His greatest work, *History of Modern Philosophy* (latest ed. 1897-1904), is distinguished by lucidity and brilliancy of style and by wide knowledge.

**Fischer-Tropsch Process.** A method for synthesising hydrocarbon oils and waxes from the gases hydrogen and carbon monoxide, prepared from coal, coke, lignite, methane (natural gas), etc. Invented in Germany by Franz Fischer and Hans Tropsch in 1925, it was intensively developed in that country to produce synthetic liquid fuels. During 1939-45 nine Fischer-Tropsch plants with a total annual output of about 500,000 tons of synthetic oil were in operation in Germany.

In the process, coal, etc., is converted into a gas mixture containing one part of carbon monoxide to two parts hydrogen by treatment at high temperatures (180°-200° C.) with air (or oxygen) and steam. The gas mixture is purified from sulphur compounds and passed at a pressure of one to ten atmospheres through specially-designed reaction vessels containing a catalyst (*q.v.*) of which

cobalt is the most important constituent. After two or three stages of catalytic treatment, 80 p.c. of the reacting gases is converted to the desired products, which are recovered from the gas stream by cooling and absorption processes. The products, almost exclusively straight-chain paraffin and olefine hydrocarbons, are separated by distillation into the following fractions: Compressed liquefied gas, 10-15 p.c. by weight; motor spirit, 30-50 p.c.; diesel oil, 25-35 p.c.; wax, 10-25 p.c.

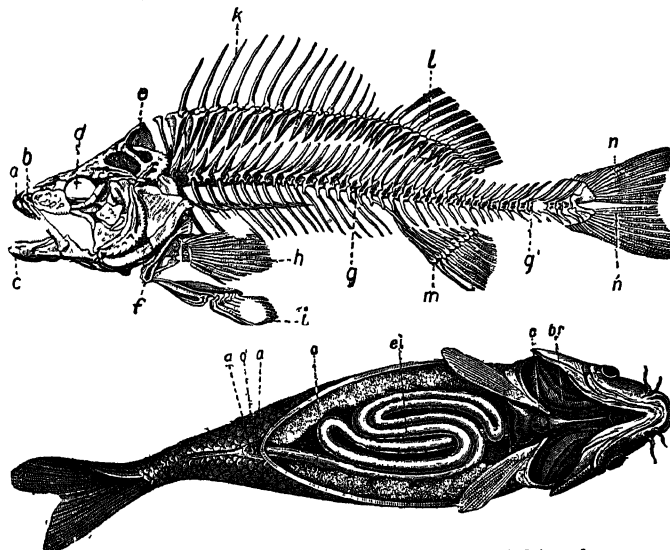
The compressed gas (propane, butane, propylene, and butylene) is used as portable fuel or as raw material for the manufacture of chemicals. The motor spirit (octane number, motor, 50) must be blended with higher grade fuel or extensively reformed to make it suitable for modern petrol engines. The Diesel oil (cetane number 78) is of exceptionally high quality and best used in admixture with low grade oils. The wax can be used in polishes, for electrical insulation, paper impregnation, etc. By further chemical treatment of the above primary products, high grade lubricating oils, soap, edible fat, and detergents can be prepared. See Hydrogenation; Low Temperature Carbonisation.

**Fiscus.** Latin word, meaning a purse, which came to be applied to the treasury of the emperor in ancient Rome, as opposed to the *aerarium* (*q.v.*), the treasury con-

trolled by the senate. As the power of the latter declined, the *fiscus* gradually became the state treasury for the whole empire, the functions of the *aerarium* being ultimately limited to the municipal finances of Rome.

**Fiset, SIR EUGENE MARIE JOSEPH** (b. 1874). Canadian surgeon and soldier. Born at Rimouski, March 15, 1874, and educated at Rimouski and Laval university, he completed his medical training in London and Paris. Fiset served with the Canadian contingent in S. Africa; in 1903 he reached the rank of colonel. Until 1906 he was director-general of medical services, and was then deputy-minister of militia and defence until 1923. He had much to do with equipping the Canadian forces for the First Great War. In 1917 he was knighted. He was M.P. for Rimouski from 1924 and lieutenant-governor of Quebec from 1939.

**Fish.** One of the classes or kingdoms of the animal world. Fishes may be defined as cold-blooded vertebrate animals, living in water, and breathing by means of gills. In a few a primitive lung is present, and the fish can breathe air directly. The limbs, when present, are paired fins; there are also unpaired fins which consist of folds or outgrowths of the skin. The body generally tapers towards the extremities, and is specially adapted for rapid passage through the water with the minimum of



Fish. Diagrams illustrating the structure of fishes. Upper, skeleton of common perch; a, pre-maxillary bone; b, maxillary bone; c, under jaw; d, palatine arch; e, cranium; f, inter-operculum; g, vertebral column; h, pectoral fin; i, ventral fin; k, dorsal fin; l, anal fin; m, anus; n, caudal fin; n', caudal fin; o, heart; o', oviduct. Lower, internal anatomy of carp; b, branchiae or gills; c, heart; d, intestinal canal; e, ovaries; f, anus; g, oviduct.



resistance. Sometimes the body is greatly flattened—either vertically, as in the rays, or laterally, as in the sole and turbot. In nearly all the genera the heart has two chambers and contains venous blood only. With few exceptions fishes reproduce their kind by eggs which are deposited in the water and fertilised by the male after they leave the body of the female, though a few species bring forth living young.

Fishes are found in all waters, both marine and fresh, and at almost all temperatures. Something like 2,300 species of fresh-water fishes are known to science; about 3,500 species are littoral; many others inhabit the seas far from land; and about 100 genera, including numerous species, have been met with in the lowest depths of the ocean.

#### Functions of the Fins

The skeletons of fishes are usually bony; but in the Elasmobranchs they are cartilaginous in character. In addition to the skeleton supporting the body outline and the limbs, there are often numerous bony rays supporting the unpaired fins also. The tail, with the caudal fin, is the principal propelling instrument, the paired fins being used as auxiliaries and for steering. The unpaired fins on the dorsal and ventral sides of the body serve mainly as balancers. The scales with which the body is more or less covered are sometimes bony. They are often nearly allied to teeth in structure and contain dentine.

Fishes breathe by extracting the oxygen contained in water, which is usually taken in by the mouth and passed out through the gill-clefts on either side at the hinder part of the head. In its course it passes over a series of arches or plates, abundantly supplied with blood-vessels, and the oxygen is thus brought into contact with the blood much as in the lungs of terrestrial animals. Most fishes are well supplied with teeth, which in some families are numerous. They may be confined to the edges of the jaws, but are often found on the palate and even on the gill arches and in the throat. There may be both cutting teeth and grinding ones, the latter often taking the form of plates. They usually grow to join the surfaces of the bones of the mouth, but are sometimes found in sockets. They are usually replaced, when worn down, by fresh teeth.

Fishes have in most species well-developed eyes, and their power of

vision is good. A few genera, found in underground streams or in the greatest depths of the ocean, are without functional eyes. Experiment proves that most species can hear well; and their sense of touch is highly developed, the barbels which are found around the mouth in many species being used for this purpose. Whether the sense of taste is as well developed is less certain. In colour fishes vary greatly, from the most sombre tones to the most brilliant hues. As a rule, the upper surface is darker than the lower, an arrangement which helps to make them inconspicuous. Protective coloration is often present, notably in the flat fish, which often so exactly resemble the mud and sand that they are very difficult to see when lying on the bottom. Many species, especially in the tropics, are gorgeously coloured and variegated to match the seaweeds and corals of their environment.

In the matter of diet fishes vary greatly, and almost everything, both animal and vegetable, that lives in the water is preyed upon by one species or another. Small crustaceans and molluscs form the most important item in the food of most fishes; but many prey on smaller fishes, and others browse on the aquatic vegetation. Some swallow mud and extract nutriment from it. As a rule, the appetite of fishes is large, and some species have such expansive powers that they will even swallow other fishes larger than themselves. Nearly all fishes are edible, though many are coarse and indigestible and a few appear to be actually poisonous. But the poor reputation of certain species is simply due to unskilful and unsuitable cooking. Fresh-water fishes, with the exception of salmon and trout, are as a rule muddy or insipid flavour compared with the marine fishes.

#### Divisions of Fish Kingdom

The class Pisces—the fishes—is usually divided into two great grades: cartilaginous fishes and bony fishes. In the former group are included the sharks and rays together with a number of extinct species and the curious Chimaera. In the bony fishes are included the lung fishes, the Crossopterygians which were believed all to be extinct until one was caught alive off South Africa in 1938 and named *Latimeria*, and all the familiar living forms. The Holosteii, the group to which the familiar forms mostly belong, though now extremely widely distributed in the

oceans of the world, where they are enormously plentiful, are probably derived from fresh-water forms which have secondarily invaded the sea, displacing the many salt-water forms which flourished in past ages.

**Bibliography.** The Migrations of Fish, A. Meek, 1916; The Biology of Fishes, H. M. Kyle, 1926; A History of Fishes, J. R. Norman, 1931; The Fishes of the British Isles, J. T. Jenkins, 1942; The Fish Gate, M. Graham, 1943.

**Fish, HAMILTON (1808-93).** An American statesman. Born Aug. 3, 1808, in New York, he became a barrister in 1830. In 1842, as a Whig, he was returned to congress, and in 1848 he became governor of New York state. In 1851 he was elected a senator. After visiting Europe, he took a prominent part in the election of Lincoln. Organizing many schemes for the assistance of troops during the Civil War, Fish was also largely responsible for relief measures for the war prisoners. During 1869-77 he was a secretary of state under Grant. One of the commissioners for the treaty of Washington, he was identified with many negotiations which improved the relations between Great Britain and the U.S.A. He died Sept. 7, 1893.

**Fish Culture.** Increasing by artificial means stocks of fish for profit or pleasure. This ancient art takes many forms: breeding, feeding, aiding normal migrations, transplantation, introduction of new species, destruction of or protection against enemies. It is pursued with varying vigour in different parts of the world for widely different human needs. Nearly always it is fresh (sometimes brackish) water fishes which are concerned. A limited number of sea fish hatcheries are in operation, but so little is known of the causes of the immense natural fluctuations and of the conditions affecting the larval and post-larval stages of fish in the sea, that, even when astronomical numbers of eggs are handled, contributions by human effort can be of little significance.

When the fish can be controlled in ponds, lakes, and rivers, in almost every civilized country the state takes a hand proportional to national needs. Over fifty years a substantial literature has come into existence on the technique of fish culture. To the Chinese must be attributed the largest experience of an art probably stereotyped in China 1,000 years before the Christian era. A French writer has described the sight of

80 junks awaiting cargoes of fry for distribution, the average value of each cargo being £5,000. The valuable species readily cultivated are the carp, eel, and trout. In Germany, especially, the routine of draining and cultivating the bed of carp ponds is understood. There has long been a considerable trade in young eels for ponds and lakes. Early in the 20th century the German government, profiting by the new discoveries concerning the life history of the eel, established an elver collecting station on the Severn at Epney, whence during 1908-14 38,000,000 elvers were shipped to Germany via Grimsby.

Denmark has developed the culture of trout for food. Starting about 1890, some 100 trout farms in Jutland handle the fast-growing rainbow trout. Streamside ponds are constructed and the fish are fed on readily obtained sea fish refuse. The trout are sold when at a size suitable for serving singly in restaurants. From 1931 to 1936 the export averaged 628 tons annually, about one third being shipped to England. Over the same period 72,000,000 trout eggs were sold abroad, chiefly to Switzerland, France, and Belgium.

In Great Britain, where access to fish supplies from the sea is easy, the taste for fresh water species is both limited and local. The score or so fish farms in existence devote attention chiefly to trout. Results with salmon have not been convincing, but attention is given to the control of netting and pollution and the construction of fish passes to enable fish to reach their natural spawning areas. Success has attended the introduction of salmon and trout to New Zealand; while in the U.S.A. the cultivation of Pacific salmon is regularly undertaken.

In 1941, of the 5,878,000,000 eggs and fry of 45 different species handled, salmon and trout of eleven species were the principal group covered. In many parts of the world mountain streams have been populated by trout.

The service of aircraft has made possible the planting of fish in areas which might otherwise be inaccessible. A striking example of successful introduction of a new commercial fish to an area where it was unknown is afforded by the experience of the U.S. fish commission with the shad. In 1871 shad fry from the Hudson on the Atlantic coast were set out in the Sacramento flowing into

the Pacific. The young fish migrated to sea and the reappearance of mature fish ascending to spawn a few years later gave indications of the success of the experiment. The fish has now spread to rivers along 3,000 miles of coastline from California to Alaska. Experiments in northern waters with the plaice have demonstrated that this species can be transplanted from areas where it grows slowly to others where growth is rapid. The Danish government in cooperation with fishermen has engaged in a regular profitable business. The fish are carried in well vessels from the Jutland coast to the inner salt water broads. English authorities have carried similar small plaice from the nursery grounds on the Danish and Dutch coasts to the Dogger Bank, where the increase in growth has been found to be 300 or 400 p.c. The cultivation of certain shellfish, mussels in particular, has been practised with success for many years. Oysters can be relaid in areas suited to their growth; the experimental station at Conway has reared oysters up to the stage when they can be set out on the growing beds.

George T. Atkinson

**Fish Curing.** Term for various methods of preserving fish. The drying, pickling, smoking, or other curing of fish especially in times of abundance against periods of scarcity, is of great antiquity. Improvement in transport, development of cold storage and refrigeration, and of canning have gone far to reduce demand for the cured fish on which, until a few generations ago, man was partly dependent for maintaining his winter protein food stocks. However, in some places, by reason of the seasonal assembly of fish shoals, such as the autumn herring off Yarmouth, or the location of a far ranging fishing fleet such as that at Hull, Grimsby, or Aberdeen, extensive industries for the preparation of cured fish still operate.

Two types of fish are best suited for curing: the cod family, in which the fat is concentrated in the liver, can be salted and dried in the sun or by artificial heat; the herring family, on the other hand, with its fat dispersed through the body tissues, needs preservation in salt solution or by salting and smoking. In the former category, besides the cod itself there are the haddock, coalfish, ling, whiting, and tusk. In the herring type are included

herring, pilchard, and sprat, and the shad and the anchovy.

**HERRING.** In Europe the herring outweighs all others in the commerce of cured fish. Long experience has taught not only the seasons of the coming of the shoals but also the periods of optimum condition for curing. For lighter cures for immediate use, e.g. kippers and bloaters, this is not of such importance as for the pickle cure in barrels. For instance, winter herrings, owing to their high water and low fat content, pine or shrink excessively in the salt solution. Early summer fish by reason of rich feeding tend to disintegrate in the barrel. The presence of milt or roe is also judged of great importance. The second half of the year furnishes the most satisfactory herrings for curing in barrels, marketed mainly along the Baltic seaboard; while fish most suitable for smoking for the centuries-old trade with the Mediterranean are those caught in Oct. and Nov.

Herrings for pickle curing are sprinkled with salt as soon as possible after discharge from the fishing vessel. At the curing yard they are again sprinkled in the farlanes or gutting troughs. From these, specially trained women, who follow the fishery along the coast, gut and pack. Each fish is seized with the left hand, and a deft movement with the short gutting knife held in the right hand removes in one operation the gills and gut: the milt or roe remains. Not only are the fish gutted at as high a rate as twenty in a minute, but they are also selected into the various trade categories for packing in separate barrels. The women work in crews of three, two gutting and one packing, their remuneration being by weekly wage plus an agreed amount for each barrel packed. It being found increasingly difficult to attract women to this work, experiments were begun with herring gutting machinery. Power-driven machines were also introduced for splitting herrings for kippers.

The packing of gutted herrings is done in orderly tiers, a layer of herring, a layer of salt, a layer of herring, and so on. Pickling begins immediately, the salt being dissolved by the natural juices of the herring. The room left in the barrel by the shrinking of the fish in this process is filled after a few days with other fish of the same cure. A hole is also bored in the bilge of the barrel, the pickle is

run off, and the space filled with more herrings; the barrel head is replaced and the pickle poured back through the bored hole, which is then closed with a bung. Stencilled on the end with the trade mark of the curer and the category of the contents, the barrel is ready for shipment or storage. Under certain strict conditions barrels of herrings receive a government brand.

#### Decline of the Trade

The changed face of Europe after the First Great War found the British herring industry deprived of its best customer, Russia; Germany and other countries on the Baltic were unable to purchase herrings to the extent they had done during the first decade of the century. Compared with an export of 8½ million cwt. in 1913, the average had fallen by the period 1933-1938 to under 2½ million cwt. A subsidy in 1919 and 1920 gave temporary stimulus, but successive crises led to legislation by which, under the Herring Industry Acts 1935 and 1938, the herring industry board was set up to reorganize, develop, and regulate the industry. For the period of the Second Great War, the board did not function, and matters affecting the herring came chiefly under the control of the ministry of Food. Recovery after the war of former markets in the Baltic Countries was slow.

Bismarck herrings and rollmops are pickled herrings further treated with white wine vinegar. Smoked herrings for export are cured almost exclusively in Yarmouth. Here, previous to a long period of smoking, suitable herrings are salted and stored in concrete vats. Export is principally to Italy and Greece.

The pilchard, rarely appearing in marketable quantities except off Cornwall, is by its perishable nature of little use except for curing. Salted and pressed in barrels, it is marketed in Italy. The catch fluctuates considerably and varied between 1,100 and 6,600 tons annually in the eleven years preceding the Second Great War.

Only at the time of its autumn migration to the coast is the sprat taken commercially. It lends itself readily to many curing processes. For immediate use it can be lightly salted and bloated or, by more intensive treatment with smoke, "redded." Both these are cold smoking methods. In special ovens the fish can be treated with hot smoke from hard wood chips, creating in a confined

space the highly prized *Kieler Sprotten*. Specially prepared sprat pickled with salt in barrels and with sugar and spices is in demand in Sweden, U.S.A., and S. Africa. The sprat catch in the eleven years before the Second Great War varied between 2,300 and 6,800 tons.

Mackerel is seldom cured in Great Britain; in some years Scandinavian vessels visit Scottish ports to cure in barrels mackerel taken in the nets of British fishermen in the course of summer fishing.

Cod. There is a demand for salted fish of the cod type in the Mediterranean countries, South America, and the W. Indies. Protective tariffs, fluctuating exchanges, movements towards self-sufficiency and improved fishing technique with up-to-date craft in the northern nations from off whose shores British trawlers had to bring their catches (Iceland, the Faroes, Norway), limited the development of British fish curing. The average annual exports of salt cod and haddock from Great Britain for the pre-war decade were 269,000 and 15,000 cwt. respectively. Other species are not separately distinguished in official statistics. Consult *The Art of Fish Curing*, R. S. Duthie, 1911; brochures of the Torry station of the department of Scientific and Industrial Research.

George T. Atkinson

**Fisher of KILVERSTONE, JOHN ARBUTHNOT FISHER, 1st BARON** (1841-1920). British sailor. Born



Russell

Jan. 25, 1841, at Rambodde, Ceylon, he entered the Royal Navy in 1854, and served in the Calcutta with the Baltic Fleet during the Crimean war. He was present at the capture of Canton in 1857 and the attack on the Peiho ports. He commanded the Inflexible at the bombardment of Alexandria in 1882, and later landed with the naval brigade, when he organized an armoured train. In 1899 he became c.-in.-c. in the Mediterranean.

Second sea lord at the Admiralty in 1902, Fisher was largely responsible for establishing the naval cadet colleges at Osborne and Dartmouth, which replaced the training ship Britannia. As first sea lord, 1904-10, he directed

great changes in naval organization, ships, and weapons, spurred on mainly by the competitive and rapid expansion of German naval power. He introduced the dreadnought and sponsored the development of oil fuel and submarines in the Royal Navy. He was made a peer in 1909. Upon the resignation of the marquess of Milford Haven in Oct., 1914, Fisher returned to the Admiralty as first sea lord.

There he energetically prosecuted the war at sea, and the decisive victory in the battle of the Falkland Islands (*q.v.*) on Dec. 8 was entirely due to his action in sending two battle cruisers secretly from the North Sea despite the opposition of the commanders in home waters. He strongly opposed the Dardanelles expedition, and in May, 1915, shortly after the offensive had been launched, resigned, maintaining that ships required by the Grand Fleet in the North Sea were being imperilled. Though publicly censured by the Dardanelles committee, he refused to defend himself. In 1919-20 he wrote letters to *The Times* criticising the conduct of naval operations during the war, notable for the refrain "sack the lot"; and in 1919 published his memoirs. He died July 10, 1920, being succeeded in the peerage by his son Cecil Vavasour Fisher (born July 16, 1868). A life of Lord Fisher was written by Adm. Sir R. H. Bacon, new ed., 1942.

**Fisher, ANDREW** (1862-1928). Australian politician. Born Aug. 29, 1862, at Kilmarnock, Scotland, he at first worked in the coal mines. In 1885 he emigrated to Queensland and in 1893 was elected to its legislature. Fisher entered the Commonwealth parliament as M.P. for Wide Bay in 1900. In 1904 he became minister of trade and customs, and in 1907 leader of the Labour party. He was thrice prime minister and during his administration of 1910-13 founded the Commonwealth Bank and began to build Canberra. He was high commissioner in England, 1915-21. He died Oct. 28, 1928.

**Fisher, GEOFFREY FRANCIS** (b. 1887). British ecclesiastic. Born May 5, 1887, he was educated at Marlborough and Exeter College, Oxford. An assistant master at Marlborough, 1911-14, he was ordained 1912, and was headmaster of Repton, 1914-32. Bishop of Chester in 1932, and transferred to London in 1939, he was appointed archbishop of Canterbury in succession to William Temple

in January, 1945, his enthronement taking place on April 19. For portrait see Archbishop.

**Fisher, HERBERT ALBERT LAURENS** (1865-1940). British historian and educationist. Born



H. A. L. FISHER,  
British historian

in London, March 21, 1865, he was educated at Winchester and New College, Oxford. As lecturer and tutor in history he remained at Oxford until 1912, when he became vice-chancellor of Sheffield university, a position he held until 1916. As president of the board of education in Lloyd George's cabinet, 1916-22, he was responsible for the comprehensive Education Act of 1918, providing a system of continuation schools and securing improved conditions for teaching. Warden of New College from 1925, he was a leading historian, his *History of Europe*, 1935, becoming a standard work. Other publications included *The Medieval Empire*, 1898; *Napoleonic Statesmanship*, 1903; *Political History of England, 1485-1558*, 1906; *Life of Lord Bryce*, 1926. Fisher died in London as the result of an accident, April 18, 1940.

**Fisher, IRVING** (1867-1947). U.S. economist. Born at Saugerties, N.Y., Feb. 27, 1867, he was educated at Yale, at which university he held a chair of political economy, 1898-1935. A member of many U.S. and foreign learned societies, he was a leading economist, and his numerous works, many translated into the chief European languages, included *The Nature of Capital and Income*, 1906; *How to Live*, 1915; *Stabilising the Dollar*, 1920; *The Money Illusion*, 1928; *The Noble Experiment*, 1930; *Booms and Depressions*, 1932; *Stable Money*, 1934; *World Maps and Globes*, 1944. He died April 23, 1947.

**Fisher, JOHN** (c. 1459-1535). English prelate and saint. Born at Beverley, he was educated at Cambridge, becoming master of the university in 1504. In 1497 he had been appointed confessor to Henry VII's mother, Margaret,



John Fisher,  
English prelate  
After Holbein

countess of Richmond, and in 1503 became the first Lady Margaret professor of divinity. In 1504 he was made bishop of Rochester. He was a keen opponent of Henry VIII's divorce from Catherine of Aragon, was imprisoned in the Tower in 1534 for refusing to swear to the Act of Succession, and on June 22, 1535, was beheaded on Tower Hill for refusing to recognize Henry as supreme head of the Church. He had been created a cardinal on May 20. A zealous humanist, he was instrumental in bringing Erasmus to Cambridge. He was beatified on Dec. 9, 1886; and on the 400th anniversary of his death, 1935, he was canonised as S. John of Rochester. His festival is on June 22. A *Life* by N. M. Wilby appeared in 1929.

## FISHERIES: A VITAL FOOD INDUSTRY

*Further information will be found in the articles on various fishes used as food, e.g. Cod; Herring, etc.; on branches of the industry—Fish Curing; Trawling, etc.; and on the world's chief fishing grounds—Dogger Bank; White Sea, etc. See illus. facing p. 3377.*

In its widest sense, the term fisheries includes the taking of all kinds of water products and embraces the hunting of whales, seals, and other aquatic mammals, the taking of shrimps, crabs, lobsters, turtles, and alligators, and the gathering of pearls, sponges, and coral. In its more general application, however, the term is restricted to the taking of fish by line, net, or trawl.

Fishing, the earliest form of hunting, provided ancient man with his first flesh food, and trading in fish was one of the earliest forms of commerce. Specially built ponds have been found in which the ancient Egyptian and Chinese kept netted fish alive until they were purchased. The Romans maintained a large and profitable trade in lampreys and eels between the seaboard cities of Italy and the most distant parts of their empire, and fish was imported into Rome from places as far distant as the Caspian Sea. Until medieval times the Mediterranean was the principal fishing ground of the civilized world, but in the 17th century the European centre of the fishing industry moved to the N. countries, notably Britain, France, Norway, and Germany. Until the development of refrigeration in the 1880s, the consumption of fresh deep-sea fish was confined to coastal districts, and inland centres were restricted to salted fish or the limited supply of fresh water fish.

Salt water fish are classified as pelagic and demersal. The former

**Fisher, SIR (NORMAN FENWICK) WARREN** (1879-1948). British civil servant. Born Sept. 22, 1879, he was educated at Winchester and Hertford College, Oxford. He was private secretary to Sir Robert Chalmers, 1908-10; a special commissioner of income tax, 1910-13; on the national health insurance commission, 1912-13; deputy chairman of the board of inland revenue, 1914-18; chairman, 1918-19. He then succeeded Sir John Bradbury as permanent secretary of the treasury, a position he held until 1939. His signature succeeded that of Bradbury on British currency notes. During the Second Great War Fisher became a special commissioner for civil defence in London, 1940-42. He died Sept. 25, 1948.

group includes mackerel, herring, and a few other species which spend the greater part of their lives in mid-water, anywhere between the sea-bed and surface, according to their feeding and spawning habits. The great majority of edible fish fall in the demersal class (bottom fish), and with few exceptions they spend the greater part of their existence on or near the sea-beds. Although a few species of demersal fish come inshore for spawning or feeding, most of them spawn in the open sea, and shoals move over vast areas of water, either by swimming or with the aid of ocean currents. Cod, haddock, halibut, saithe, plaice, and other deep-sea fish feed very close to the bottom, where light, temperature, and movement are but little felt. Fast swimming fish, such as dog-fish and hake, come near the surface in search of food, but they rest and spawn on the sea-bed, and it is there that they are caught. Hake is essentially a deep-water fish and is normally caught at a depth of 350 fathoms, while cod is caught in bulk only on the fringe of the icefields in the Arctic circle. Of the demersal fishes cod is the most important, providing about half of the weight taken; among the pelagic, the herring predominates.

In normal times the most important European fisheries are those of Norway, and before the Second Great War Norwegian fishing fleets landed a total annual catch worth £10,000,000, mostly

cod and herring. The chief fisheries of Belgium are of the in-shore variety, and the shore fishing catch of France includes herring, mackerel, sardines, anchovies, and sprats. Before the Second Great War Germany had an extensive deep-sea and inshore fishing industry, the principal catches being cod, haddock, whiting, plaice, lemon sole, ling, and herring, which were landed at the North Sea and Baltic ports. Dutch fishing fleets are mainly concerned with the catching of flatfish, eels, herrings, and cod, which are marketed on the Continent and in Great Britain. Of the produce of the Portuguese, Spanish, and Italian fisheries, more than half is sardines.

In the western hemisphere are the great fisheries of N. America, extending from Labrador to Massachusetts. Seven years after Cabot discovered Newfoundland and reported upon its rich cod fisheries, France sent over her fishing fleets and paid bounties to encourage the industry. Other nations soon followed, and the Newfoundland cod fisheries have been responsible for more than one war between European powers. Icelandic waters now rival the Newfoundland banks for cod, and also yield great catches of haddock, ling, and halibut. By the use of ocean-going trawlers equipped with refrigerators, the British have fully exploited the Iceland fisheries and also developed extensive fisheries in the White Sea and the waters round Bear Island, far within the Arctic Circle.

#### Importance of the Herring

By far the most important fish commercially is the herring, and the largest catches are made by the fishing fleets of Norway, Sweden, France, and Great Britain, while this fishery is growing rapidly in Canada; herring constitutes 25 p.c. of the yield of all European fisheries.

Nearly every country with a seaboard has a fishing industry of some kind, and of recent years the West Indies, Australia, and New Zealand have developed a considerable export trade from their local fisheries. China, Japan, India, and Russia have large fishing industries, but the greater part of their catches is absorbed by home markets. Before the Second Great War, Japanese fishing fleets operated extensively off the American Pacific seaboard.

Of fresh water fish the most important is the salmon. The salmon of the American Pacific coast are caught when they are entering the

streams from the ocean to spawn. Both Canada and the U.S.A. have a vast export trade in canned salmon. Fresh water fish such as carp are bred in Central Europe, and various species of trout are raised in the hatcheries of Britain and the U.S.A.

**BRITISH FISHERIES.** The level of supplies, as seen in the accompanying table, shows no extreme variation from year to year, and has been maintained to an increasing extent by the proportion of the catch derived from the Arctic seas (Bear Island, Barents Sea, and

LANDINGS IN ENGLAND AND WALES

Years	Fish, excl. Shellfish cwt.	Value £	Shellfish Value £	Total value £
1928	13,444,000	13,184,000	429,000	13,613,000
1929	14,287,000	14,444,000	378,000	14,822,000
1930	15,678,000	14,143,000	378,000	14,521,000
1931	14,616,000	12,026,000	350,000	12,556,000
1932	13,756,000	11,318,000	352,000	11,670,000
1933	13,663,000	11,190,000	367,000	11,557,000
1934	13,575,000	11,960,000	397,000	12,357,000
1935	14,347,000	11,956,000	403,000	12,359,000
1936	15,813,000	11,931,000	444,000	12,375,000
1937	17,035,000	11,933,000	442,000	12,375,000
1938	15,533,000	12,233,000	409,000	12,642,000

Demersal fish are taken as to 97 p.c. by a net dragged over the sea bed (trawl or Danish seine). Lines to a limited extent in most European countries, except Norway, Iceland, and the Faroes, are used for both classes of fish. Trawling to any extent in the N. Sea began only about a century ago. Before the 1880s sail predominated. Trawlers visited the waters off Iceland in 1891, N. Russia in 1905, Spain and Morocco in 1906, and Newfoundland in 1911. From 1895, when the otter trawl replaced the beam trawl of the sail and early steam trawler, the capacity and efficiency of fishing gear were increased in many ways; greater depths and areas formerly considered unsuitable for trawling were explored and charted. In 1938 the British steam trawler fleet numbered about 1,400 vessels, of which 1,153 had their home ports in England and Wales. Of these 721 sailed from Grimsby and Hull, a number exceeding that of the rest of European countries combined. The two Humber ports accounted for nearly three-quarters of the trawl fish supply of the country.

Of some 4 million tons of fish landed in W. Europe in 1936, Norway and Gt. Britain were each responsible for about one quarter. Next in order with 569,000 tons came Germany, then France (275,000 tons), Iceland (261,000 tons), the Netherlands (160,000 tons), Sweden (110,000 tons), and Denmark (84,000 tons). Germany's special effort was towards supplying her own extensive need for herrings.

Iceland). The depressing effect of large quantities of low-grade fish was such that by mutual agreement the industry had to regulate production, and the Sea Fishing Industry Act, 1933, enforced a close season in certain N. waters during the summer. The changes which took place in ten years in the proportion of North Sea fish to that from the N. seas are indicated by the fact that, whereas between 1928 and 1938 the North Sea catch of demersal fish declined from 2,866,000 cwt. to 1,658,000 cwt., that from the principal northern fisheries rose from 3,763,000 cwt. to 8,427,000 cwt. Inshore fishing in Britain occupies many men. Small as their contribution is to the whole, it covers the most valuable fishes—salmon, trout, eels, and shellfish, including molluscs (oysters, mussels, cockles, crabs, lobsters, crayfish)—and pilchards and sprats.

In 1913 there were 15,000 vessels of all types manned by 80,000 men and boys engaged in the fishing fleets of Great Britain. Immediately following the First Great War, the industry suffered a serious decline in the face of subsidised foreign competition, and a system of quotas was established, but, although fishing revived considerably in the years immediately preceding the Second Great War, in 1938 it was little more than 70 p.c. of the figures for 1913; the number of vessels of all types had been reduced to 13,700 and the number of men employed as crews had declined to 56,000.

The plight of the once prosperous herring industry was the

major cause of the decline in the British industry. The control of herring affairs now falls to the herring industry board. It owes its origin to the first inquiries instituted by the sea fish commission appointed to recommend remedies for the depression which came over the herring industry in the world slump of the 1930s. Over a twenty-year period the export of herrings had fallen by 55 p.c. and home consumption by 45 p.c. The steam drifter fleet from which comes 80 p.c. of the herring catch decreased from 1,500 vessels in 1913 to 1,088 in 1933. The herring board found it necessary to reduce the fleet still further, and, by 1938 only 685 steam drifters remained. The contraction can be ascribed to the First Great War, which lost Britain her principal customers. In 1911-13 the average number of barrels exported to Germany, Russia, and the Baltic states was 2,424,000; in 1933 it was only 727,000 barrels. Parallel with this shrinkage, policies of self-sufficiency were developing: Germany's production increased from 251,000 in 1929 to 1,059,000 in 1937, and her volume of trawled herrings grew from 56,000 tons in 1930 to 163,000 in 1937; herring production on the N. Russian coast grew from 1,000 tons in 1930 to 99,000 tons in 1935. Further measures taken by the herring board aimed at tightening control over the quality of herrings exported, regulating the number of the nets and the areas fished, financing the purchase of fishing gear and the repair of vessels, and aiding research. The herring industry board resumed its work in 1946 after a wartime standstill during which many of the earlier problems became even more acute by reason of territorial and population changes in Europe.

#### Fisheries Convention for Europe

In the closing years of the 19th century, alarm was expressed in more than one country at the decline in the fish population, especially of the flatfish. Discussions led to the formation of the international council for the exploration of the sea, with headquarters at Copenhagen. An elaborate programme of research, interrupted by the First Great War, covering all matters affecting the sea and its inhabitants was entered upon. The outcome was prospective international legislation for the rational exploitation of European fisheries. In 1937 a fisheries convention was signed by the governments of Great

Britain, Belgium, Denmark, Germany, Iceland, Eire, the Netherlands, and Sweden. Amongst other things, the convention regulated the sizes of the meshes of otter trawls and seine nets to be used by vessels of the signatory countries in certain waters of the E. Atlantic. But for the outbreak of war in 1939, the convention would have been extended to provide for the replenishment of the fish population in the North Sea and eastern N. Atlantic.

#### Experiments in Re-Stocking

Fishermen have done little towards conservation or planning for their future supplies. There are several sea fish hatcheries in Europe, but their work is experimental only and, in view of the as yet little understood causes of the great fluctuations in the abundance of natural brood, cannot be regarded as contributing much to the stock. Oyster breeding, on the other hand, after some years of experiment, appears to be a commercial possibility. In Denmark fishermen cooperate with the government in transplanting young plaice from the coast, where they grow slowly, to the inner part of the Lim Fjord, where the growth in a season is so increased as to make the undertaking worth while on a commercial scale. English experiments have shown that similar results can be obtained by conveying small plaice from the inshore nursery grounds to the rich feeding grounds on the Dogger Bank in the middle of the North Sea where no small plaice are normally found. Important experiments in the acceleration of flatfish growth by adding artificial fertilisers to the water were carried out in Argyllshire lochs from 1944. But these enterprises are still experimental.

Cooperation of scientists and fishermen has produced systems of finding fish shoals by two methods: one is the adaptation of electronics as applied to the location of underwater objects such as submarines, the other by rapid assessment of areas with an abundance of microscopic plankton on which fish such as the herring feed. It is also possible to forecast with some accuracy prospects of fish harvests some time ahead. This has been done for herring, haddock, and cod, and is based on a study of the age composition of the shoals in one year and calculating subsequent mortality.

THE SECOND GREAT WAR. At the outbreak of the war, control over the movements of British

fishing vessels passed to the Admiralty, and as a result of security measures and the laying of minefields fishing was restricted to the grounds around Iceland, off the W. coast of Scotland, in the Irish Sea, and off the W. coast of Ireland. Large numbers of fishing vessels also were requisitioned for naval purposes (see Fishing Fleet). The amount of fish available during the war always fell far short of the demand, therefore, and Great Britain was obliged to draw largely upon supplies of frozen, salted, and tinned fish from Newfoundland, Canada, Alaska, and California. Further, many distant and neutral countries embarked upon campaigns to exploit their natural fishery resources. New Zealand developed an important industry in the canning of mullet and ling fish, while Australia greatly increased the yield from its domestic fisheries and established a government controlling body for the more orderly marketing of fish. Most of the S. American republics developed fishing industries for domestic consumption to replace the interrupted imports of food from abroad, and also established canneries for the supply of fish to the belligerent countries.

#### Wartime Fluctuations

Throughout the first year of the war in Europe, the U.S.A. fisheries greatly increased their yield of all kinds of fish, the bulk of the surplus being exported to neutral and Allied countries in Europe. With America's entry into the war, however, the requisitioning of many of the fishing industry's vessels caused a big drop in yield. In 1941 American fishing boats landed 2,500,000 tons of fish, but the following year the yield dropped to under 2,000,000 tons. Very limited fishing activities were conducted by Germany and the Axis-dominated countries of Norway, Denmark, and Finland.

Fishing was rehabilitated in the liberated parts of Italy under Allied control, and, following the Allied invasion of Europe in 1944, the French, and later the Dutch and Belgian, fishing industries began to revive. The North Sea grounds, however, continued to be greatly hampered by minefields. In 1945 the world's fisheries yielded a total catch of 14,000,000 tons; but in many countries fish continued in short supply owing to the dislocation of transport and other trade channels.

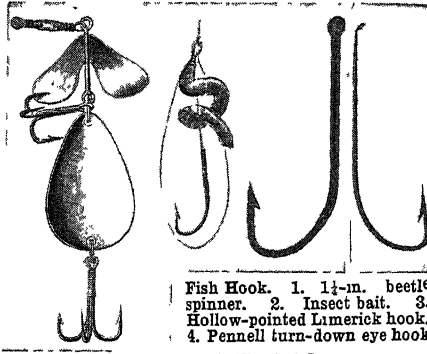
Owing to the relaxation during the war of measures designed to



maintain the fish population, there was over-fishing of certain areas, causing some concern regarding the future. Accordingly, the United Nations interim commission on food and agriculture established a sub-committee on fisheries to advise the commission on the preparation of a plan for international cooperation in the development and proper use of the world's fishery resources.

**Fisher's.** Island of the U.S.A. Situated at the E. end of Long Island Sound, 3 m. off Connecticut, it forms a part of Suffolk co., New York. It is about 8 m. long by 1 m. broad. It is frequented as a summer resort, and the chief occupation is agriculture. The U.S. government maintains a military and naval reservation, Fort Wright. Pop. about 400.

**Fishguard** OR ABERGWAEEN. Urban dist., seaport, and market town of Pembrokeshire, Wales. It stands on the Gwaen near its entrance into Fishguard Bay, 12½ m. N. of Havertfordwest. As the British Railways terminal port for Cork, Fishguard has an excellent harbour and a fine breakwater (2,500 ft.), a coastguard



By courtesy of S. Alcock & Co.

and sharpened before the wire is bent into shape. The shanks are then ringed or flattened, and the hooks are hardened, tempered, and scoured. Machinery performs the various processes automatically. Hooks vary greatly in size and shape, from the huge hook with swivel and chain attachment used for catching sharks, down to the tiny-eyed hook on which the smallest trout flies are dressed.

**Fishing.** Art or practice of catching fish. It is divided into two main branches. Sea fishing is done chiefly by men who work at it for a livelihood, and to whose efforts are due a considerable portion of the world's food supply. In this trawling plays an important part. The other branch is known more usually as angling, and is pursued mainly by amateurs for their own amusement, although in America great quantities of salmon are caught for food by professional fishermen. Fly-fishing is a form of angling.

The chief fish caught by the professional are the cod, herring, and mackerel; by the amateur, salmon and trout. Whale fishing, seal fishing, and pearl fishing are special branches.

Fishing is one of the oldest arts practised by man, and there is evidence that he did something of this kind 8,000 years ago. Various devices were employed and some of the earlier forms, made of stone and bronze, have been unearthed. Throughout the ages the existing varieties of rod, bait, and all the accessories were evolved. Close times are enforced by law, while a long series of Acts, which may be

said to date from Magna Carta, lay down the law for the U.K. Dealing with fisheries of every kind, deep sea, inshore, and inland water, they forbid the use of poison or explosives for the purpose of catching fish, make regulations about the registration and management of fishing boats, and lay down conditions for conserving supplies and using them in the interest of the nation.

For England and Wales the law is administered by the ministry of Agriculture and Fisheries while Scotland has its own department for the purpose. The United States, Canada, and other countries are equally vigilant in this matter. International agreements deal with areas, such as the Newfoundland banks and Bering Sea, where men of different nations meet. See Angling; Close Time; Fisheries; Fly Fishing; Trawling.

**Fishing Fleet.** Term used to describe a number of fishing vessels operating from a single home port, or vessels from different ports fishing in the same grounds. In a general sense it includes all vessels fishing under the same national flag; in Great Britain there are the Merchant Navy and Fishing Fleets. The latter includes not only steam and motor trawlers and drifters for deep-sea fishing, but also the longshoreman's yawl for line fishing in coastal waters. Grimsby, Lowestoft, Yarmouth, and Aberdeen all have large fishing fleets, consisting mainly of trawlers divided into three main groups: the small type, between 70-110 ft. long, which catch first-quality fish in home waters such as the North and Irish Seas; medium-sized vessels up to 140 ft. long, which fish the outer waters of the North Sea; and large trawlers of 130-180 ft. long, which go to Iceland, Bear Island, the White Sea, Greenland, and the Davis Straits. Equipped with radio, ice storage accommodation, and liver oil extractors, these vessels steam up to 5,000 miles during a voyage of 5-6 weeks and may bring home cargoes of 300 tons of fresh fish.

The largest individual fishing fleet in Great Britain is that engaged in netting herrings; in normal times over 800 drifters work from British ports during the herring season. Drifters vary



Fishguard. Bay of the Pembrokeshire port from which steamers cross daily to Eire

and lifeboat station, and a pier constructed by the G.W.R. in 1906. Slate is worked in the neighbourhood and fishing is an industry. There is normally steamer communication with Rosslare in co. Wexford, Eire. In 1797 Fishguard was invaded by some 1,200 French soldiers, who were forced to surrender to the local yeomanry. Market day, Thurs. Pop. 2,963.

**Fish Hook.** Apparatus for catching fish. At first a flake of flint sharpened at both ends, with a thong attached to the centre, was employed for this purpose. But the antiquity of the metal hook is great, bronze fish hooks of modern shape having been found in lake-dwellings in Switzerland and elsewhere.

The modern fish hook is made of soft cast steel wire. The wire is cut into lengths and the barb formed

between 50–100 ft. in length, and of recent years the tendency has been to fit them with motors instead of steam engines. The most notable fishing fleets outside Great Britain are the French ships which each year sail to Labrador for cod, and the Newfoundland motor dorries which operate off the Grand Banks.

During the Second Great War trawlers and drifters were requisitioned from the British fishing fleets for service with the Royal Navy as minesweepers, escort vessels, and patrol ships. In 1938, the British fishing fleets numbered 13,700 vessels aggregating 275,000 tons, of which 4,400 were sailing vessels and 9,300 steam and motor ships. The number of men and boys employed as crews was 56,000. The total losses suffered in the Second Great War, among vessels serving with the R.N. and those attacked in the fishing grounds, were 384 trawlers and 41 drifters.

**Fishing Rod.** Rod used by anglers. Its purpose is to cast the line and keep it clear of the bank or shore upon which the fisherman is standing, and it varies with the nature of the sport. Salmon fly rods, which are liable to great strain, are usually of cane with a steel rod in the centre, and measure from 16 ft. to 17 ft. 6 ins. For trout and other fresh-water fishing a lighter rod from 12 ft. to 13 ft. in length has been found the most suitable. Fishing rods are usually jointed in sections for greater convenience, and are fitted with a reel to wind in the line. See Angling.

**Fishkill.** Village of New York state, U.S.A., in Dutchess co., E. of the Hudson, 5 m. N.E. of Beacon. One of the oldest places in the state, it was settled by the Dutch and has two churches dating from the 18th century, one being the building in which the provincial convention of New York met in 1776, and in which deserters and spies were held during the Revolution. Cider making is the chief industry. Pop. 720.



Fishing Rod. Left, salmon rod and three joints; right, pike rod and joints

By courtesy of S. Allcock & Co.

**Fish Lice.** Small crustaceans of the order Copepoda (*g.v.*), which are parasitic on fishes. They depart widely from the typical forms of the order.

**Fish Measure.** Special measures of capacity used in the sale of fish. These can be summarised thus: 4 fish make 1 warp; 33 warps, a long hundred; 10 long hundreds, a long thousand; 10 long thousand (13,200 fish), a last. In addition to this 500 herrings make a code, 600 herrings a mease, and 615 herrings a maze; 37½ gallons of fresh herrings equal a cran, and 26½ gallons of cured herrings a barrel. A barrel of anchovies is 30 lb.

**Fishmongers' Company.** London city livery company. Founded to exercise a monopoly of the fish trade of London, and originally divided into two companies, Salt-fishmongers and Stock-fishmongers, its earliest extant charter is dated 1364, but the foundation fraternity of S. Peter existed in the 12th century. Sir William Walworth (*g.v.*) and Thomas Doggett (*g.v.*) were members; King George VI and the duke of Gloucester are freemen. The company examines all fish brought into Billingsgate. The hall in Upper Thames Street, E.C., was built in 1831–33, near the site of its two predecessors, the first of which was burnt in 1666 and rebuilt 1671. It was severely damaged by air raids in 1940. In it are shown Walworth's dagger, an embroidered Tudor pall, and a chair made from one of the original piles of old London Bridge.

**Fish Residues.** Fish offal suitable for manufacture into various by-products. The main products are fish meal, oils from the livers of fish, and oil and manure from the intestines. Fish meal is made chiefly from the head and bones; it is a valuable food for cattle and pigs. Medicinal

oil is principally the product of the livers of the cod and halibut. Other oil used in commerce and industry, especially in the process of tinning and in the manufacture of margarine and soap, is extracted from the livers and intestines of various fish. Fish manure is a valuable fertiliser, used particularly in the growing of beet.

The fish from which most of the waste material is obtained include herring, codfish, whiting, haddock, pilchard, and menhaden. A large amount of herring waste is obtained from the herrings prepared for curing, in which usually the head, the gills, and the viscera are rejected. In making kippers from herrings the gills and viscera are rejected. From the codfish the liver is always separated for the manufacture of cod-liver oil, the head, gills, viscera, and the backbone being used for by-products.

The industry is extensive in the U.S.A. and in Norway, but is still in its infancy in Great Britain, where in many fishing ports there is no provision for utilising the waste, which is emptied into the sea. Factories already exist, however, at Grimsby, Hull, Milford Haven, Falkirk, Montrose, Fraserburgh, Wick, and Aberdeen. The industry has received considerable stimulus from the shortage of the supplies of natural guano from Peru. Two kinds of fish guano are made, one from herring, the other from white fish. The former contains a large percentage of oil, which has to be extracted in the manufacture of guano, the product from the oily residues being a dark-coloured, soft fish guano. The product from the white fish is a dry, friable, light-coloured, more valuable guano. The value of fish guano depends upon its ascertained chemical analysis, the two most valuable constituents being phosphate of lime and nitrogen.

Cod-liver oil comes from the liver of that fish, the oil in white fish being accumulated in the liver instead of being scattered throughout the flesh, as it is in the herring. Hence the livers of the cod when caught are immediately separated, kept fresh, then broken up and allowed to ferment, after which they are cooked until the oil is free, and can be run off. A certain amount of stearine is present in this oil, and must be separated before the oil is used medicinally.

Sardine oil is obtained from the heads of the fish tinned in France and Spain. Menhaden oil, collected in the U.S.A., is used to make certain paints.



Fishmongers' Company arms

**Fiske, JOHN** (1842–1901). An American historian and philosopher. Born March 30, 1842, he was educated at Harvard, where he became lecturer on philosophy and assistant librarian. In philosophy, especially in Outlines of Cosmic Philosophy, 1874, he did much to popularise the evolutionist theory, combined with a belief in immortality, which he supported. His historical works cover most of the development of the U.S.A. from the earliest times to his day. He died July 4, 1901



*John Fiske*

**Fisk University.** An American educational institution. Founded in 1866 at Nashville, Tennessee, it is for the education of coloured persons and is named after Clinton B. Fisk (1828–90), an American soldier and philanthropist, who was active in its creation. The teaching given at Fisk is somewhat off the ordinary university lines. Money for its endowment was raised in Great Britain by the Jubilee Singers (*q.v.*), as they were called; coloured men also gave concerts, etc., for this purpose.

**Fission.** In atomic physics, the name given to the disintegration of the nuclei of some elements into two or more approximately equal fragments when exposed to bombardment by neutrons of the correct speed. While most elements when bombarded by neutrons (or other particles) divide sooner or later into an almost unchanged nucleus and a light particle such as a proton, a few elements, *e.g.* uranium and thorium, exhibit the phenomenon of fission which may be accompanied by a large release of nuclear energy. *See* Atom; Atomic Bomb.

**Fissurellidae** (late Lat., little fissures). Family of small limpets which have a hole at the apex or margin of the shell, whence their popular names, keyhole and slit limpets. Five species are found around the British coasts.

**Fistula** (Lat., pipe). Abnormal opening between a cavity in the body and the skin, or between two cavities in the body. For instance, a communication between the rectum and bladder is termed a recto-vesical fistula.

**Fit** (A.S. *fitt*, struggle). Popular term for a sudden seizure, accompanied by loss of consciousness

with or without convulsions. *See* Convulsions; Epilepsy; Hysteria.

**Fitchburg.** City of Massachusetts, U.S.A., one of the co. seats of Worcester co. On a branch of Nashua river, 49 m. W. by N. of Boston, it is served by rlys. Settled 1719, it was incorporated 1764, and received a city charter 1872. Fitchburg manufactures textiles, clothing, shoes, paper, saws, guns, knives, and locks, and quarries granite. It has a high school known for the Fitchburg Plan originated in 1911, which established a cooperative system under which boys studying engineering divided their week between classes and work as paid apprentices in local industry. Pop. 41,824.

**Fitchée** (Fr. *fiché*, fixed). In heraldry a cross with a spike at its lower extremity is said to be fitchée or fitchy. It represents the proper cross of the old pilgrims and crusaders, which was stuck in the earth to improvise an altar.

**Fitchett, WILLIAM HENRY** (d. 1928). Australian author and journalist. Educated at Melbourne university, he entered the Methodist ministry. He edited the Melbourne Daily Telegraph and Southern Cross, and became principal of the Methodist Ladies' College. In 1897 his book, *Deeds that Won the Empire*, attained immediate success. His other works include *How England Saved Europe*, 1899; *Fights for the Flag*, 1900; *Wellington's Men*, 1900; *Nelson and his Captains*, 1902; *Wesley and his Century*, 1906; *The Tale of the Great Mutiny*, 1907. He died May 24, 1928.

**Fitter.** Term used in engineering to designate the workman who assembles parts of machinery and makes them fit. The work is highly skilled. The term is also applied in tailoring to one who takes measurements, and adjusts garments to fit their wearers.

Fitter is also a trade classification in the British army and the R.A.F. Army fitters attached to mechanical transport units are responsible for the upkeep of vehicles, and ordnance corps fitters are employed in the maintenance of guns and other weapons. In the R.A.F. there are fitters, engine; fitters, armourers; fitters, marine; and fitters, motor transport. These trades are among the most highly skilled and best paid.

**Fitz** (Lat. *filius*; Fr. *fil*s). Old Anglo-Norman word formerly split *fiz* and meaning *son*. Like Scots Mac, Irish O', and Welsh ab, ap, it is prefixed to proper names to show parentage. Familiar ex-

amples are Fitzalan, Fitzgerald and Fitzwilliam. It is specially used to indicate natural sons of royal blood, *e.g.* Fitzjames, duke of Berwick, son of James II.

**Fitzgeorge.** Name taken by the three sons of the duke of Cambridge and his morganatic wife, Miss Louisa Fairbrother, the actress, whom he married in 1840. One of them, Sir Adolphus Augustus Frederick Fitzgeorge (1846–1922), entered the navy and retired as rear-admiral. In 1904 he was knighted. Another, Sir Augustus Charles Frederick Fitzgeorge (1847–1933), entered the Rifle Brigade in 1865 and later served in the 11th Hussars. He retired as a colonel and was knighted in 1904.

**Fitzgerald, LORD EDWARD** (1763–98). Irish rebel. Son of the 1st duke of Leinster, he joined the English army, served in Ireland, and in 1781 was wounded at the battle of Eutaw Springs in America. He was elected to the Irish parliament as member for Athy, afterwards



*Lord Edward Fitzgerald*

travelling in America, and in 1792 was cashiered for attending a revolutionist banquet in Paris. He joined the United Irishmen in 1796 and took an active part in the plans for the French invasion. The plot was discovered and Fitzgerald died in prison, June 4, 1798, from wounds inflicted by one of his captors. His wife Pamela was generally, but wrongly, believed to be a daughter of Madame de Genlis by Philippe Egalité, duke of Orleans. She was probably born in Newfoundland. She married Fitzgerald in 1792 and lived until Nov., 1831.

**FitzGerald, EDWARD** (1809–83). English poet and translator. He was born March 31, 1809, at Bredfield House, near Woodbridge,



Suffolk, the son of John Purcell, who assumed his father-in-law's name, FitzGerald, nine years after the poet's birth. Spending his boyhood abroad, he was sent, in 1821, to a school in Bury St. Edmunds, entering Trinity

College, Cambridge, five years later. He became intimate with Thackeray and Spedding; later with Tennyson and Carlyle. On leaving the university he spent a short time in France, but returning to Suffolk in 1831 never left it again, for more than a week or two, till his death, June 14, 1883.

His life, spent among books, flowers, and music, was that of a recluse; he began the study of Spanish in 1850, that of Persian in 1853. His world-famous translation of *The Rubáiyát of Omar Khayyam*, preceded in 1856 by an anonymous version of the *Sálmán and Absál of Jami* in Miltonic verse, was first published in Jan., 1859; but lay for months neglected, even by the translator's own friends, until Rossetti discovered it in the fourpenny box of a second-hand bookseller, and Swinburne proclaimed its genius to the world. A second, greatly revised, edition appeared in 1868, and its subsequent popularity has been phenomenal. FitzGerald also published *Euphranon*, a Platonic Dialogue, 1851; *Six Dramas of Calderon*, 1853; a version of the *Agamemnon*, 1876; two *Oedipus Tragedies*, 1880-81; and *Readings in Crabbe*, 1882. The dedication of Tennyson's *Tiresias* to "Old Fitz" advanced FitzGerald's personal reputation, but it was not till W. Aldis Wright brought out, in 1889, his *Letters and Literary Remains*, and, in 1895, his *Letters to Fanny Kemble*, that the world knew much of the man whose work it had long since taken to its heart.

He married, in middle life, Lucy, daughter of Bernard Barton, the Quaker poet, and the interest of his later years was centred in the sea, "knocking about somewhere outside of Lowestoft," as he puts it himself. He was a witty, picturesque, and sympathetic letter-writer, on terms of intimacy with the most interesting men and women of the day. His verse is tranquil and exquisite: the cultured expression of most attractive speculations.

**Bibliography.** *Letters and Literary Remains*, ed. W. A. Wright, new ed. 1902; *Letters to Fanny Kemble*, 1895; *Two Suffolk Friends*, F. H. Goorme, 1895; *Lives*, J. Glyde, 1900; *T. Wright*, 1904; *A. C. Benson*, 1905.

**Fitzgerald, Percy Hetherington** (1834-1925). Irish writer. Born in co. Louth, he went to Stonyhurst and Trinity College, Dublin. Called to the Irish bar, he became crown prosecutor, but abandoned law for literature. He contributed stories to Dickens's

*All the Year Round*, and produced a study of Dickens, whose friendship he enjoyed, and historical and theatrical works, also *Memoirs of an Author*. He engaged in sculpture as a hobby, and his statue of Dr. Johnson stands in London in the churchyard of S. Clement Danes. He died Nov. 24, 1925.

**Fitzherbert, Maria Anne** (1756-1837). Wife of George IV. A daughter of Walter Smythe, of Brambridge, Hampshire, she married in 1775 Edward Weld, of Lulworth Castle, Dorset. Her second husband was Thomas Fitzherbert, and after his death in 1781 she lived at Richmond. In 1785 she met the prince of Wales, who fell in love with her, but to avoid his attentions she went abroad. He pressed his suit, however, and the pair were married privately on Dec. 21, 1785.

According to the Royal Marriages Act, 1772, the union was illegal, and some, but not the prince, held that it was invalid; the lady being a Roman Catholic, it was sanctioned by the pope. In 1795 George married Caroline of Brunswick and Mrs. Fitzherbert left him for a time. They lived together again until 1803, when the prince began to tire of her. They finally parted, but George seemed to retain some affection for her to the end. Mrs. Fitzherbert, who had an allowance of £6,000 a year, died at Brighton, March 29, 1837. A box of papers was left by her to her executors for use at their discretion, but its contents were never fully examined. *Consult* Mrs. Fitzherbert and George IV, W. H. Wilkins, 1905.

**Fitzmaurice, Edmond George Fitzmaurice**, 1st Baron (1846-1935). British politician. Born June 19, 1846, second son of the 4th marquess of Lansdowne, he was educated at Eton and Trinity, Cambridge, and called to the bar in 1871. During 1869-85 he was M.P. for Calne. In 1880 he was commissioner for the reorganization of the European provinces of Turkey and Crete; in 1882-83, second plenipotentiary at the Danube conference in London. In 1882 he became under-secretary for foreign affairs in the Liberal ministry, but in 1885 lost his seat. Cricklade elected him in 1898 and

he retired in 1905. Again under-secretary for foreign affairs, he was made a peer in 1906. Lord Fitzmaurice wrote *Lives of the Earl of Shelburne* (1875-77) and *Earl Granville* (1905). He died without an heir, June 21, 1935.

**Fitzmaurice-Kelly, James** (1857-1923). British man of letters. Born in Glasgow, June 20, 1857, he devoted himself to the study of the language and literature of Spain. He was Taylorian lecturer at Oxford, 1902; Norman MacColl lecturer at Cambridge, 1908 and 1912; Gilmour professor of Spanish at Liverpool, 1909-16; and professor (Cervantes chair of Spanish) at King's College, London, 1916-20. His works include *Life of Cervantes*, 1892; *A History of Spanish Literature*, 1898; *Lope de Vega and the Spanish Drama*, 1902; *Editions of Cervantes in English*, 1901-03, and the *Oxford Book of Spanish Verse*. He died Nov. 30, 1923.

**Fitzpatrick, Sir Charles** (1853-1942). Canadian lawyer. Born in Quebec, Dec. 19, 1853, he was educated at St. Anne's college and Laval university there. In 1876 he became a barrister, and in 1879 crown prosecutor for Quebec. From 1890 to 1896 he was a member of the legislative assembly of Quebec. At the general election of 1896 Fitzpatrick entered dominion politics as member for the same city in the house of commons at Ottawa. That year he was solicitor-general under Laurier, and in 1902 became minister of justice. In 1906 he was chosen chief justice of Canada, retaining this post until made lieutenant-governor of Quebec in 1918. In 1907 he was knighted. During the years 1908-10 he was a member of the Hague tribunal. He died in June, 1942.

**Fitzroy.** River of Queensland, Australia. It is formed by the union of the Dawson with the Mackenzie, and takes an easterly course to discharge into Keppel Bay. It is navigable for steamers up to 1,000 tons to Rockhampton, a distance of 35 m. One of the most important rivers in Queensland, its fertile valley contains stock farms which supply the refrigerating works on the coast. Irrigation is practised by pumping from open water and from underground supplies.

Another river of this name in W. Australia rises in King Leopold range, and pursuing a generally westerly course empties into King Sound on the Indian Ocean. It is navigable for 100 of its 300 m,



Mrs. Fitzherbert,  
wife of George IV  
After R. Cosway

**Fitzroy.** North-eastern suburb of Melbourne, Victoria, Australia. It is a manufacturing centre, with a rly. station and several large recreation grounds, including the Edinburgh Gardens to the N.E., the Carlton Gardens to the S.W., and the Fitzroy Gardens to the S., laid out with fine avenues of trees.

**Fitzroy, SIR ALMERIC WILLIAM** (1851–1935). British public official. He was born Nov. 12, 1851, and went to Balliol College, Oxford. Entering the educational department of the privy council in 1876, he acted as secretary, and in 1898 was appointed clerk of the privy council, resigning in 1923. He was chairman of committees on physical deterioration, 1903–04; the Midwives Act, 1909; member of Royal Commission on venereal diseases, 1913–16; sat on the Dentists' Act committee, 1918–19. He was knighted in 1911. In 1921 he published a biography of Henry, duke of Grafton, in 1923 his own memoirs. He died May 31, 1935.

**Fitzroy, EDWARD ALGERNON** (1869–1943). British politician. Born July 24, 1869, son of the 3rd Lord Southampton, he was educated at Eton and Sandhurst, and joined the 1st Life Guards. He was Conservative M.P. for S. Northamptonshire (now Daventry division), 1900–06, and from 1910 continuously. He was deputy-chairman of committees, house of commons in 1922; and in 1928 he succeeded J. H. Whitley (*q.v.*) as Speaker. Fitzroy was the first soldier to be given this office, and the first to die holding it, as he did on March 3, 1943. His widow Muriel was granted the title of Viscountess Daventry.

**Fitzroy, ROBERT** (1805–65). A British sailor. Son of Lord Charles Fitzroy, he was born in Suffolk, July 5, 1805. He entered the R.N. College in 1819, and became lieutenant in 1824. In 1831–36 he sailed in command of the *Beagle*, a brig engaged in surveying the S. coast of S. America, with Charles Darwin as naturalist. In 1839 Fitzroy published his *Narrative of the Surveying Ships H.M.S. Adventure and Beagle*, in three volumes, the last written by Darwin. In 1841 he was M.P. for Durham, and in 1843 was appointed governor of New Zealand, but his attitude towards the settlers incurred their anger and he was recalled in 1845. He became vice-admiral in 1863 and died April 30, 1865. He is remembered by his Fitzroy barometer and for creating a system of storm warnings which developed into the daily weather forecast.

**Fitzroy's Cypress** (*Fitzroya patagonica*). Evergreen tree of the family Coniferae. A native of Patagonia, it has slender, spreading branches and flat, overlapping, oval-oblong leaves. The cones are small and star-shaped, consisting of nine scales. The height of the trunk is 100 ft.

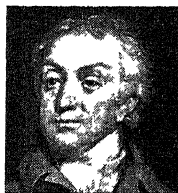
**Fitzsimons, ROBERT** (1862–1917). British pugilist. Born at Helston, Cornwall, June 4, 1862, he went to New Zealand at the age of nine, and was trained as a blacksmith. He entered the ring as a professional, and moved to Sydney, where he beat Bill Slam, West, and Professor Hall, but was beaten by Jem Hall in the contest for middle-weight championship.

Proceeding to the United States in 1890, he defeated Jack Dempsey—to be distinguished from the later pugilist of the same name—in 13 rounds in the fight for the middleweight championship of the world; beat Peter Maher in 12 rounds; and in 1897 obtained the heavyweight championship at Carson City. In 1899, he was defeated by Jeffries, and in 1902, at 40, he challenged Jeffries again, to be beaten in the eighth round after putting up a splendid fight. In 1905 he was beaten by Jack O'Brien, and after meeting Jack Johnson and Bill Lang, he retired from the ring in 1912 after an exceptionally long career. "Bob" Fitzsimons died Oct. 22, 1917.

**Fitzwilliam, EARL.** A British title held by the family of Fitzwilliam since 1746. The family traces its descent from Sir William Fitzwilliam of Elmley, Yorkshire. It became specially prominent in the time of Elizabeth. Sir William (1526–1599), the grandson of a London merchant who was also a servant of Cardinal Wolsey, passed much of his time in Ireland as lord deputy, 1571–75 and 1588–94, and acquired lands there. His grandson was made an Irish baron in 1620.

William, the 3rd baron (1643–1719), was created a viscount and an earl in 1716. Another William was made baron (1742) and earl (1746) in the peerage of the U.K. He married Anne, daughter of the marquess of Rockingham, a union that brought Wentworth Woodhouse, near Rotherham, and large estates to the family. The 2nd earl, William Wentworth, is noticed separately (*v.i.*). In 1943 William (b. 1910) became 8th earl on the death of his father. The earl owns large estates in Yorkshire and Wicklow. When there is an eldest son he is called Viscount Milton.

**Fitzwilliam, WILLIAM WENTWORTH FITZWILLIAM, 2ND EARL** (1748–1833). A British statesman.



*Wentworth Fitzwilliam*  
After W. Owen

Born May 30, 1748, he succeeded the first earl in 1756. In 1782, on the death of his uncle, Lord Rockingham, he succeeded to the York-

shire estates of the Wentworths and added their name to his. He was president of the council in 1794, and in 1806–07. Lord-lieutenant of Ireland for a few months in 1795, he was recalled on expressing sympathy with Catholic emancipation. In 1798 he was appointed lord-lieutenant of the W. Riding of Yorkshire, but was dismissed in 1819 for censuring the Manchester magistrates over the incident called the Peterloo massacre. A life-long friend of C. J. Fox, Fitzwilliam died Feb. 8, 1833.

**Fitzwilliam House.** Institution at Cambridge University. Founded in 1869 to provide a cheaper education than that in the colleges, it was known until recently as the Non-Collegiate Students. A social and collegiate life developed so that today, except for lack of buildings, Fitzwilliam House offers the same life as the colleges. The present house was purchased in 1887. Administration is by a board appointed by the council of the senate. The board appoints the censor, who acts as senior tutor. Dining and the tutorial system are compulsory. Fitzwilliam House itself dates from 1727, and some parts may be even earlier; it was formerly called Halstead or Halsted House, having belonged to a family of that name. It is a pleasing example of the simple red brick architecture of the early 18th century.

**Fitzwilliam Museum.** Art and archaeological museum in Cambridge, founded in 1816 by Richard, 7th Viscount Fitzwilliam of Merrion, who bequeathed to the university his collections of pictures, drawings, prints, medieval MSS., books, etc., together with an endowment for the provision of an exhibition gallery. This was begun in 1837 from the designs of George Basevi and finished in 1874 from those of E. M. Barry. The pictures include works by Titian, Tintoretto, Veronese, Rubens,

Rembrandt, Hals, Gainsborough, Reynolds, Cézanne, Renoir, and Degas. 16th and 17th century masters and mezzotints of the 18th century are well represented in the print room. Among the MSS. are fine English, French, Italian, and Netherlandish examples. A collection of ceramics has a particularly fine English series and products of European factories and of the Near and Far East. The collection of coins is among the richest in Europe. Other departments are those of armour, textiles, Greek and Roman antiquities, and music. See Cambridge University illus.

**Fiume.** Seaport on the Adriatic. It stands on the river Rječina, at its outfall into the Bay of Quarnero, at the N.E. extremity of the Adriatic. It has several harbours—the Fiumara canal, used by coasting vessels; the Baross harbour; the main harbour, which is protected by a mole; and the free and petroleum harbours to the W. Virtually all the shipping trade of Hungary passed through its port, and the fisheries are of great importance. The town possesses distilleries, petroleum refineries, and mills, while there is trade in fruit, barrels, staves, furniture, tobacco, paper, chemicals, fertilisers, and soap. In architecture, the cathedral, the Roman triumphal arch, and the governor's residence may be mentioned. Under the Austro-Hungarian empire Fiume was a crown-land of Hungary, with an area of 8 sq. m. The pop. was largely Italian, but the suburb of Sushak across the river, and the surrounding area, were inhabited by Yugoslavs, chiefly Croats. Pop., pre-war, 53,896.

Fiume's mixed population of Italians, Croats, Magyars, and others made it a point of racial dispute. Long a small centre of coastwise trade, it came into prominence only when the Budapest-Zagreb-Fiume railway was built. Originally known as S. Vitus in Flumine, in 1465 it became a Hapsburg possession. Charles VI declared it a free port in 1717, and in 1776, by a decree of Maria Theresa, it was handed over to Croatia. In 1807 it was incorporated in Hungary. Two years later, under Napoleon, it became part of Illyria. In 1822 Fiume was restored to Hungary, but as a result of the Croatian national movement of 1848 was reunited to Croatia. In 1861 it was made autonomous. The Magyars favoured the Italian section of its inhabitants, and for nearly fifty years this union strove to prevent Slav predominance.



Fiume. View from the sea of this Adriatic port. It was ceded to Yugoslavia by Italy in 1947

After the First Great War possession of Fiume became a burning question. Though not assigned to Italy by the treaty of London (1915), it was claimed as Italian because it contained a majority of Italian-speaking inhabitants. The Croats, and on their behalf the new Serb-Croat-Slovene government, claimed it historically and on the ground that with Sushak it was inhabited by a majority of Southern Slavs.

The feeling between Yugoslavia and Italy as to its possession became more strained. Matters came to a head when on Sept. 11, 1919, Gabriele d'Annunzio (*q.v.*), at the head of the Italian volunteers, seized Fiume and set up a national council or provisional government. On Nov. 12, 1920, the treaty of Rapallo, signed by the representatives of Italy and Yugoslavia, established an independent state of Fiume which was to be slightly larger than the district formerly incorporated in Hungary. Insurgents denounced the treaty, and d'Annunzio declared that Fiume was in a state of war with Italy. The government of the latter expelled the insurgents. In 1924, by an agreement defining their relations in regard to the Adriatic, Fiume was annexed by Italy, while Baross harbour and the Delta were annexed by Yugoslavia. One of the four docks of Fiume was to be leased to Yugoslavia for 50 years in return for the yearly payment of a fixed sum; the railway station to be under a sort of international regime.

Marshal Tito's Yugoslav forces occupied Fiume (Yugoslav, Rijeka) on April 30, 1945. It was included in the territory ceded to Yugoslavia by Italy under the peace treaty of 1947.

**Five Knights' Case,** THE. Trial in the court of king's bench, Nov. 22, 1627. Sir Thomas Darnell, with four other knights, Corbet, Earl, Hampden, and Heveningham, had been committed to the Fleet prison in March by warrant signed only

by the attorney-general for refusing payment of the forced loan raised by Charles I. They applied for a writ of Habeas Corpus, demanding that the warden of the fleet should bring them before the court of king's bench and specify the cause of their committal.

The case came on for argument and the gaoler returned that they were imprisoned by the king's special command, *i.e.* for no stated offence; and the court, presided over by Chief Justice Hyde, decided, Nov. 28, that this was sufficient ground for committal. The prisoners did not deny the right of the crown to imprison in certain circumstances without showing cause, but pleaded that they were imprisoned for refusing to subscribe to the forced loan, of which they denied the legality. See Forced Loan.

**Five Members.** Specially, the five members of parliament whom Charles I tried to arrest, Jan. 4, 1642. Relations between crown and commons were strained when the king ordered the attorney-general to prepare articles of impeachment against the five: John Hampden, John Pym, Denzil Holles, Sir Arthur Hazlerigg, and William Strode. This was done, one of the charges being that of levying war against the king, and the house of lords was asked to order their arrest, a necessary preliminary to their trial before that body. This the peers refused to do, so the king went with the serjeant-at-arms to do it himself; with him were about 300 attendants.

He entered the house just as the warned members had escaped by river to the city, and asked the Speaker for them. Lenthall replied that he could only do as the house directed him, to which the king answered, "I see all the birds are flown." Next day Charles went to the city, but again he failed to secure the five. The impeachment was declared illegal. On Jan. 11 the members returned to



Westminster, a great concourse of people, both on the river and on the banks, cheering their arrival.

**Five Mile Act.** Act passed in 1665 which forbade those ministers who had been expelled from their livings in 1662 to reside within five miles of any corporate town or teaching in any school. They could obtain relief only by subscribing to the Act of Uniformity and taking an oath that resistance to the king was unlawful. The Act was part of the Clarendon Code, and became inoperative by lapse of time.

The name was applied also to an Act of 1593 by which popish recusants convicted of not going to church were forbidden to go more than five miles from home. Repealed in 1844, it had long been a dead letter.

**Five Nations.** Name given to the Indian nation of the Iroquois, because it consisted of five tribes. These were Mohawks, Oneidas, Cayugas, Onondayas, and Senecas. Early in the 18th century they were joined by the Tuscaroras and were known as the Six Nations. (See Iroquois.) It is also the name of a volume of poems by Kipling, the five nations being the chief members of the British Empire.

**Fives.** Game of handball. It is played either with the bare hand or with gloves, though at the present time almost invariably with the

latter. The derivation of the word fives is doubtful, although various suggestions have been made that it is so called from the five fingers of the hand, or that it was played by five people on each side.

Fives was popular early in the 19th century, when it was played in closed spaces especially built for the purpose, and also in tennis courts. One of the most famous fives courts was in S. Martin-in-the-Fields, and there is an old print representing fives in the tennis court in Leicester Fields, which gives some idea of the game as then played. A feature was that the ball was bounced on the ground, and then struck with the hand for the service. The ball nowadays is thrown up so that it touches first the back wall and then a side wall before the receiver hits it. William Hazlitt's obituary of John Cavanagh, the Fives Player, which appeared in *The Examiner*, is the best-known piece in the literature of the game.

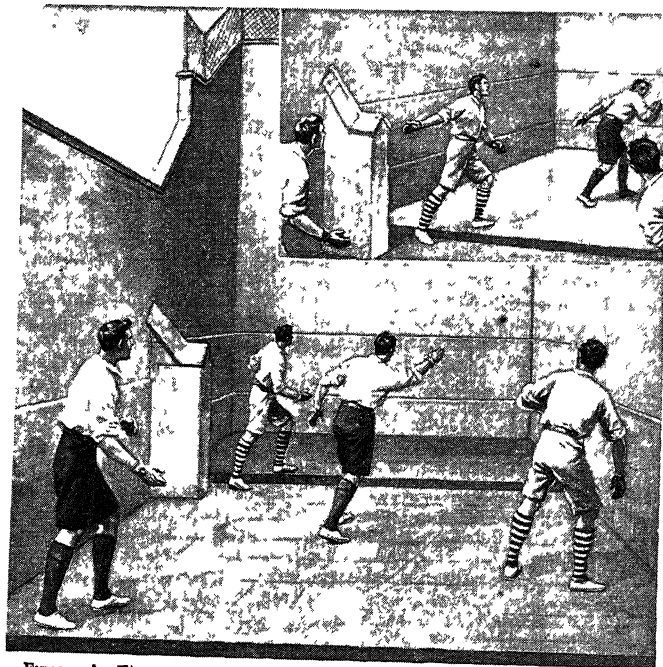
In modern days fives is played chiefly in three forms of court, one being the Eton. The court, unique in several features, originated from part of the chapel at Eton against which the game used to be played. A buttress and some of the chapel steps gave rise to the present hazards in the court which afford so much interest and variety to the

game. The court has three walls, and not long ago all courts were uncovered. Now there are a few courts covered by a pent-house roof. The game needs four players, and demands the highest skill and quickness of movement.

A Rugby fives court, called after the school of that name, is a four-walled building covered with a roof. The walls are all plain, except that on the front wall there is a ledge or board, above which the ball must be struck to be in play. The game is played at most public schools; the rules were revised and brought up to date in 1913. Winchester fives is similar to the Rugby game, except that in the left-hand side wall of the court there is a projecting buttress which forms a hazard. Courts of this kind exist only in one or two places outside Winchester. Like the Rugby game, it can be played by one or two players a side. The service is given by one player throwing the ball on to the wall. His adversary can refuse any service, but if he does not refuse it, he must hit the ball on to the right-hand side wall, and then on to the front wall above the ledge or line.

In all varieties, after the rules of service have been complied with, the game proceeds by rallies, i.e. the ball is returned on the volley or after one bounce and must go above the ledge. The player who first fails to do this loses the rally, and either yields the service to another player or, if he was the receiver, loses a point. A game consists of 15 points. The ball is made like a rackets ball. The foundation is of cloth, bound tightly round with twine and covered with white kid. The weight of the ball in Eton fives is 1½ oz. and in Rugby 1¼ oz. Apart from its vogue in public schools, the game is popular in the north of England, specially prepared courts or alleys being in use in co. Durham.

**Five Towns, THE.** Name given in various novels by Arnold Bennett (*q.v.*), a native of the district, to the towns of the Potteries district of Staffordshire. In reality there were six separate towns—Stoke-upon-Trent, Hanley, Burslem, Tunstall, Longton, and Fenton—federated in 1910 into one administrative co. borough which became the city of Stoke-on-Trent (*q.v.*) in 1930. Bennett's five were thinly disguised as Knype, Hanbridge, Bursley, Longshaw, and Turnhill; and he extended the topographical analogy in other details, e.g. Waterloo Road, from Burslem to Coat-



Fives. An Eton game in progress, illustrating the construction of the court. Inset, about to volley for the pepper-box

bridge, became Trafalgar Road, from Bursley to Bleakridge. Novels introducing the Five Towns include *The Old Wives' Tale*, Clayhanger, *Hilda Lessways*, *These Twain*, *The Card*, Whom God Hath Joined, *Anna of the F.T.*, *Leonora*, and *Helen with the High Hand*; there are also three volumes of short stories, *Tales of the F.T.*, *The Matador of the F.T.*, and *The Grim Smile of the F.T.*

**Five Year Plans.** Economic programmes of the Soviet Union. The first plan, 1927-32, provided for the creation of basic industries and was initiated by a central planning office. The second, 1932-37, and third, 1937-42, dealt mainly with the processing industries and the production of articles for the home market. The fourth plan, 1946-50 inclusive, had as its objectives the rehabilitation of war-devastated districts, the restoration of industry and agriculture, and the surpassing of the pre-war level of production.

The first three programmes were fulfilled in the main, but at the cost of great privation inflicted on the population and the retention of a low standard of living. By 1938 industrial production was nine times greater than in 1913; but agricultural developments were not in proportion, the peasants having destroyed large numbers of stock and wasted grain in face of forced collectivisation. The five year plans were based on the principle that the Soviet Union must be self-sufficient, foreign trade being taken into account only where the acquisition of foreign currency was necessary. The fourth programme called for an increase in industrial output of 48 p.c. as compared with 1940, in farm produce of 27 p.c. Each republic was allotted a "target" figure for its industries and a capital sum for the execution of its task.

The development of the iron and steel centres of the Urals, Siberia, and the Far East continued; new mines and plants expanded the non-ferrous metal industry, especially in Central Asia, N. Urals, and E. Siberia. New mines were projected in the Moscow and Pechora coalfields, and vastly increased production was expected from the Kuznetsk basin, Urals, Ukraine, Caucasus, and Central Asia. Maximum development of petroleum extraction and refining was ordered in the east as well as in the Ukraine. Thirty hydro-electric stations were to be erected; and by 1950 the pro-

duction of synthetic rubber was to be doubled; more cotton was to come from Siberia and Central Asia. The construction of 4,500 m. of new rly. track was called for, including the Stalinsk-Magnitogorsk line. The Stalin White Sea-Baltic canal was to be rebuilt and the Mariinsk waterways constructed, the mercantile fleet to rise by 600,000 tons by 1950. Air lines were to connect Moscow with the capitals of the constituent republics.

**Fixation.** Term used in psychology to denote the arrest of an instinct during its growth at some point short of maturity, with the result that the emotions which should accompany the functioning of the instinct retain or regress to a childish form. A mother-fixed man seeks in all his love objects the mother who gives all and asks little or nothing in return. *Consult Psycho-Analysis*, E. Glover, 1939.

**Fixed Oils.** Term used by the old alchemists and still current in pharmacy. They constitute a homogeneous group of oils present in animal and vegetable organisms. Olive oil, almond oil, linseed oil, castor oil, have been known from earliest times and valued for their emollient and other properties when used externally. Cod liver oil and castor oil have long enjoyed reputations for their medicinal properties. All members of the group are more generally described under *Fatty Oils*.

**Fixture** (Lat. *figere*, to fix). Term used in English law for a thing of a chattel nature which is affixed to the freehold, so as to become part of it, and, therefore, to become realty and not personalty. Sometimes these things can be removed again by the people who put them there, so that they become personal property again, and sometimes not. Practically, questions about fixtures become important as between landlord and tenant, between the devisee and the personal representative of a deceased, and between the representative of the owner of a particular estate, e.g. a tenant for life, and the ultimate owner. In the second case the devisee is entitled to all fixtures, but in the third the personal representative may remove those put up for ornament or trade if he can do so easily.

As between landlord and tenant the right of removal is stronger. A tenant is entitled to remove all fixtures put up by him for ornament or convenience which can be removed without much damage to the premises, e.g. marble mantel-

pieces, pier-glasses, tapestry, grates, etc., or cupboards fixed in hold-fasts. The tenant may remove trade fixtures unless in so doing he causes serious damage to the property. Similarly agricultural fixtures can be removed, but the tenant must make good any damage he does. A tenant must remove his fixtures before his tenancy expires—he cannot go back afterwards and take them away. If he leaves them behind he has no claim to them, or to compensation for them, as many people suppose; nor can he demand that a succeeding tenant shall pay for them. They are the landlord's property. *See Landlord; Tenant*.

**Fizeau's Experiment.** This experiment was made by A. H. L. Fizeau (1819-96) to determine the velocity of light. The apparatus consisted of a toothed wheel, which was made to revolve at a definite speed. The teeth of the wheel cut off the view from a light when a certain speed was reached, and enabled calculations to be made of the time taken for the light to travel from its source to a distant mirror and back again. *See Light*.

**Flaccus.** Name of a well-known Roman family, the following members of which deserve mention: (1) Quintus Fulvius, Roman general in the second Punic War. Together with his colleague, Appius Claudius Pulcher, he captured Capua in 212. (2) Marcus Fulvius, one of the commissioners appointed to carry out the agrarian measures of Tiberius Gracchus, who met his death, with Gaius Gracchus, in 121. (3) Marcus Verrius, a grammarian in the reign of Augustus, the author of a work on the Meaning of Words, abridged by Festus (*q.v.*). The poets Horace and Valerius also belonged to the family. *See Horace; Valerius*.

**Flacius** or **VLACICH**, MATTHIAS (1520-75). Lutheran divine. Born at Albona, Illyria, March 3, 1520,



Matthias Flacius,  
Lutheran divine

he studied languages in Venice, and theology at Basel, Augsburg, and Wittenberg, where he came under the influence of Luther and Melancthon, and was appointed professor of Hebrew in 1554. Henceforth he was involved in a series of controversies, siding with Luther against Melancthon. He settled in turn at Magdeburg, Jena,

where he was professor of theology, Ratisbon, Antwerp, Strasbourg, and Frankfort-on-the-Main, where he died in poverty, March 11, 1575.

One of the charges against Flacius was that of Manichaeism, based on his statement that sin was inherent in human nature from the Fall. The work in which this appeared, *Clavis Scripturae Sacrae* (Key to Holy Scripture), 1567, formed the basis of biblical hermeneutics, a term defining the principles and laws governing biblical interpretation as distinguished from exegesis (*q.v.*). Other works of Flacius replied to the Roman objection to the Reformation as a mere innovation, and traced Church history from an evangelical standpoint.

**Flag** (*Iris*). A large genus of perennial herbs. Of the family Iridaceae, they are natives of the N. temperate regions. The species form two groups: one in which the rush-like foliage dies down each autumn, and the life of the plant is continued by a long

bulb-like rootstock; the other in which the thick, sword-shaped leaves arise



from stout, slightly creeping rhizomes. The term flag is generally applied to members of the second group, the others being spoken of by the name *Iris* (*q.v.*). The leaves enfold each other at the base, and from their midst rises the flower stem, bearing the large brightly coloured flowers.

There are three sepals and three petals, the sepals much larger than the petals, and the stamens expanded to look like petals. The yellow flag (*I. pseudacorus*) is common in ditches and marshes. The blue flag (*I. germanica*), so common in gardens, is wild in S. and Central Europe. The seed vessel is a large, leathery

capsule, splitting when ripe into three pod-like divisions, packed with large flattened seeds.

**Flag.** A sheet of stuff, particularly coloured, or of a single colour, plain or bearing symbols, and flown from a staff or halyard. Flags may be national or personal. They were known to the ancients, though the standard or symbol placed on the top of a staff, like the Roman eagles, was more common. This was followed by the gonfalon type, and then by the guidon, a small piece of stuff attached to a lance. In mediæval days the shapes and sizes of flags were diverse, but were soon strictly regulated. The standard was a large and long flag, often with one, two, or more points, parti-coloured and decorated with crests, badges, and devices. The banner was large and square, or rectangular, emblazoned with armorial devices, and denoted that the bearer was entitled to levy and lead troops.

The standard with one point was known as the guidehomme (abbreviated into guidon); the ancient was a small guidon; the pennon (bearing badges and motto only) was half the size of the guidon, and had one tail; the pendant was the ship's guidon; the pennoncelle or pencil, a small pennon, attached to a lance and usually bearing a single heraldic symbol; the pavon was a triangle, with horizontal base, the banderolle a long narrow flag or streamer, such as the modern pennant.

National flags evolved slowly. The English white flag with the red cross of S. George appears to have been introduced by Richard I on his return from the East, but it long appeared side by side with many others, including the royal armorial banner. The British national flag is the Union Jack (*q.v.*). The white ensign, consisting of the red cross of S. George and the union flag in the jack, or upper left quarter, may be worn only by ships of the Royal Navy and yachts of the Royal Yacht Squadron. The blue ensign is the flag of the Royal Naval Reserve, worn only by merchant ships whose commanders and a certain proportion of the crew are members. Subject to conditions, 37 British yacht clubs are entitled to the blue ensign, and 32 to the blue ensign defaced with the club badge. Defaced with crossed swords in the fly, the blue ensign is worn by ships operated by the War office. The red ensign, which has

a Union flag in the jack, is the flag of the merchant navy and may be worn by six British yacht clubs, provided it is defaced with the club badge.

Yacht clubs entitled to fly the blue or red ensigns must have an Admiralty permit, the issue of which depends upon strict conditions. The yacht must be registered at a British port and owned by a British subject belonging to one of the clubs recognized in the Navy List. Warrants are granted only to yachts used for cruising, and should a yacht be turned to commercial purposes the permit is at once withdrawn. Admiralty regulations prohibit the wearing of ensigns without warrant on the Upper Thames, the Norfolk Broads, or Cumberland lakes, or any other tidal waters, rivers, lakes, or inland waters.

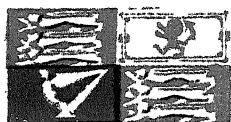
By the Merchant Shipping Act of 1894, no British merchant ship may fly at the stern any flag except the red ensign, unless her master is entitled to the blue ensign. In no circumstances may either ensign carry a house-badge or other distinctive mark. Most British dominion and colonial flags consist of the blue or red ensigns with a Union flag in the jack and national emblems or shields in the centre or fly. Regimental flags have a field the colour of the regimental facings, and the regiment's badge and battle-honours in the centre. See Colours, Ensign.

**Flagellants** (Lat. *flagellum*, little whip). Name given to various ascetic bodies in the R.C. Church whose adherents practised flogging themselves or one another as a means of disciplining the flesh and promoting spiritual growth. They arose in Italy in the 13th century, and continued to break out sporadically for about 150 years. One of their chief leaders was Cardinal Peter Damiani, who taught that a vigorous scourging was worth many years of ordinary self-denial and mortification. In 1260 there was a great outbreak of this form of fanaticism at Perugia, and in the following century it caused trouble in Germany and Hungary.

When the Black Death swept over Europe in 1348, the Flagellants had a great revival, and held processions through the streets stripped to the waist and singing penitential psalms. A halt was called at intervals, and all scourged one another in turn. About 120 of these enthusiasts reached London,



**Flag.** Yellow Flag, *Iris pseudacorus*, showing the tall sword-like leaves; top, flower of *Iris foetidissima*



ROYAL STANDARD



UNION JACK



WHITE ENSIGN (FOR ALL NAUTICAL)



RED ENSIGN (MERCHANT NAVY)  
FOR NAVAL RESERVE THE SAME  
WITH BLUE FIELD



CANADA (PROPOSED 1946)



AUSTRALIA



NEW ZEALAND



UNION OF SOUTH AFRICA



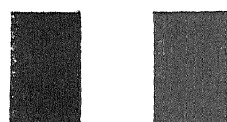
INDIA



PAKISTAN



IRE



FRANCE



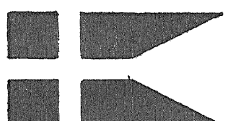
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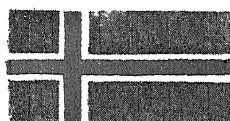
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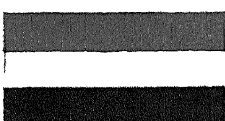
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DENMARK



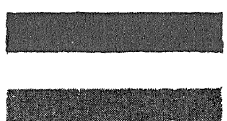
ICELAND



NETHERLANDS



FINLAND



LITHUANIA



POLAND



PORTUGAL



CZECHOSLOVAKIA



ALBANIA



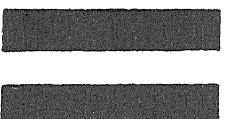
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SWITZERLAND



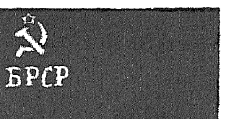
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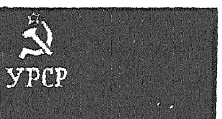
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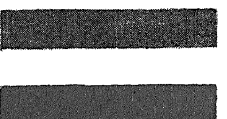
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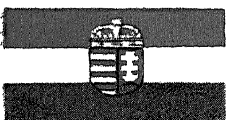
WHITE RUSSIA



UKRAINE



YUGOSLAVIA



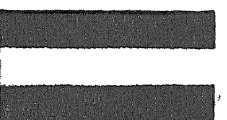
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ITALY



BULGARIA



SPAIN

FLAGS OF THE NATIONS: (1) BRITISH COMMONWEALTH AND EUROPE



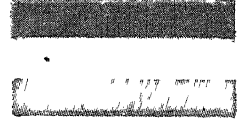
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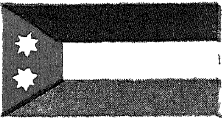
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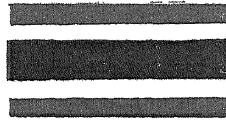
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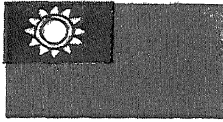
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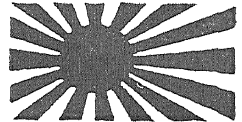
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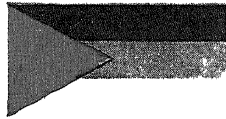
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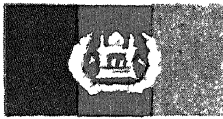
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EGYPT



HEJAZ



AFGHANISTAN



ABYSSINIA



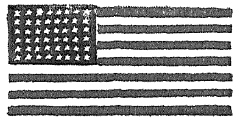
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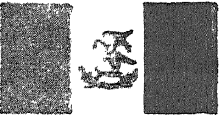
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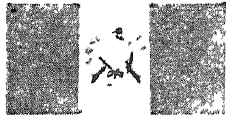
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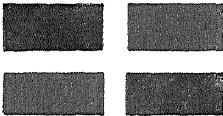
UNITED STATES OF AMERICA



MEXICO



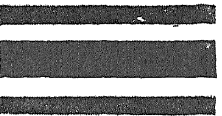
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DOMINICAN REPUBLIC



NICARAGUA



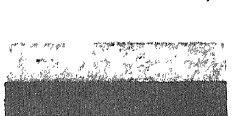
COSTA RICA



COLOMBIA



ECUADOR



VENUEZUELA



PANAMA



HONDURAS



HAITI



CUBA



BRAZIL



PERU



BOLIVIA



PARAGUAY



CHILE



ARGENTINA



URUGUAY



PHILIPPINES

## FLAGS OF THE NATIONS: (2) ASIA, AFRICA, AND NORTH AND SOUTH AMERICA

but won no followers in England. They were denounced by Pope Clement VI, and finally suppressed by the Inquisition.

**Flagellata** OR **MASTIGOPHORA**. Sub-division of the protozoa. Found in stagnant water, they have "whiplike" threads of protoplasm which by their lashing movements propel the animal through the water.

**Flagellum**. A filamentous protoplasmic outgrowth arising singly or among a few of its kind from the surface of a cell in which a basal granule occurs near the point of attachment. The reciprocating or spiral movement of a flagellum, unlike that of a cilium, is independent of the motion of any other structure of the same kind which may be present, but similarly induces relative or actual movement in the liquid into which it projects. Both flagella and cilia may possibly be sensitive to contact stimuli.

**Flageolet** (Fr.). Wind instrument of flute tone, played vertically through a mouth-tube. The modern instrument has a separate mouthpiece, but those of the 17th century had the blowing hole on a sloped end of the main tube, like the present-day penny whistle. The true 17th century flageolet had two of its six finger-holes at the back; these were governed by the player's thumbs. See Recorder.

**Flag Lieutenant**. Lieutenant in the Royal Navy appointed to act as aide-de-camp to an admiral, and usually a specialist in signalling. His insignia consists of the aiguillette or golden cord on his left breast.

**Flag Officer**. Naval officer of the rank of rear-admiral or above who is entitled to hoist a flag on board ship to denote his command. There are four grades of flag

officer in the Royal Navy: rear-admiral, vice-admiral, admiral, and admiral of the fleet. The flags are: rear-admiral's, S. George's cross with two red balls, flown at the mizzen; vice-admiral's, S. George's cross with one red ball, flown at the foremast; admiral's, S. George's cross, flown at the mainmast; and admiral of the fleet, Union Jack. They are derived from the banners which were flown on board ship in the days when generals held the principal commands at sea. A commodore or other senior officer below the rank of rear-admiral flies a pennant or burgee when in command of a squadron.

**Flagship**. Vessel in which a flag officer is accommodated, and in which he flies a distinctive flag to indicate the ship to which others must look for signals. A single fleet may have many flagships, according to the number of its tactical units. The tactical unit is a division of four ships, usually with a rear-admiral in command; and two divisions make a squadron, over which is a vice-admiral, who also has charge of one of the two divisions. A number of battle squadrons, with their attendant craft, make up a fleet, the commander-in-chief, as a rule, flying his flag in a vessel which is outside the divisional formation, and at liberty to place herself where she chooses.

At the principal home naval stations the flag of the local commander-in-chief is flown in an old warship, i.e. the Victory at Portsmouth, the Impregnable at Devonport, the Pembroke at Chatham, and the Crescent at Rosyth, but the officer lives in an official residence ashore. Most of the senior departmental officers in flagships, i.e. those chosen for staff, gunnery, torpedo, navigation, or engineering duties, receive a special flag allowance in addition to their pay. Vessels that are not flagships are sometimes called private ships. See Battleship; Navy.

**Flagstaff**. City of Arizona, U.S.A., the co. seat of Coconino co. Situated at an altitude of 6,907 ft., it is on the main line of the Atchison, Topeka, and Santa Fé rly. and has an airport. It is in an area of national parks, forests, and monuments, Indian reservations, and sheep and cattle ranches, and is the centre for tourists visiting the Grand Canyon, Painted Desert, Petrified Forest, etc. Flagstaff trades in livestock and lumber. Dry farming is carried out in the surrounding

country. First settled by white men in 1876, it was incorporated as a city in 1928. Pop. 5,080, including Indians, Mexicans, and Negroes.

**Flagstone**. Fine-grained argillaceous sandstone, which splits easily in slabby fashion along the bedding plane. Fine sandstones which do not show this so-called lamination are sometimes included under the same name. Flagstones are composed mainly of minute grains of quartz, but generally contain also some feldspathic and micaceous material. The colour of flags varies from almost white to grey or yellow; while the mica flakes, if present, give the stone a sparkling appearance in the sunlight. Their fine, even texture, their strength, and the readiness with which they break into blocks of convenient size make them suitable for use as building stones.

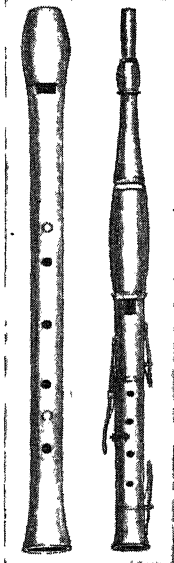
Flagstones are mainly used, however, for paving-stones, kerbstones, hearths, sills, and steps, and those varieties which split into very thin layers, for roofing.

**Flaherty**, ROBERT JOSEPH (b. 1884). American film director. Educated at Upper Canada College, Toronto, he led four expeditions into subarctic eastern Canada, explored and mapped the archipelago known as Belcher Islands, Hudson Bay, and also the unknown lands of N. Ungava. In 1920 he entered the film industry, later producing *Nanook of the North*, a picture dealing with the Eskimos of Hudson Bay. Then he made *Moana*, a study of the Samoan Islands. His finest films included *Tabu* (1929-31); *Man of Aran* (1932-34); *Elephant Boy* (1935); *The Land* (1939-41), this being made for the U.S. department of agriculture.

**Flak** (German *Fliegerabwehrkanone*, cannon against aircraft, giving the initials F.L.A.K.). Anti-aircraft fire; specifically, the actual projectile and its fragmentation after exploding. During the Second Great War the term flak was at first used by R.A.F. crews in reference to "flaming onions," German incendiary shells fired in bursts and resembling a string of onions. Later the word indicated any A.A. barrage, whether friendly or hostile.

A flak ship was a small German craft of the coastal or trawler type mounting anti-aircraft guns, used in the Second Great War for the protection of small coastal convoys or of ships in harbour.

A flak tower (Ger. *Flakturm*) was a concrete tower mounting heavy



Flageolet. Left, 17th century instrument; the open circles show thumb positions at back of tube. Right, modern flageolet with four keys

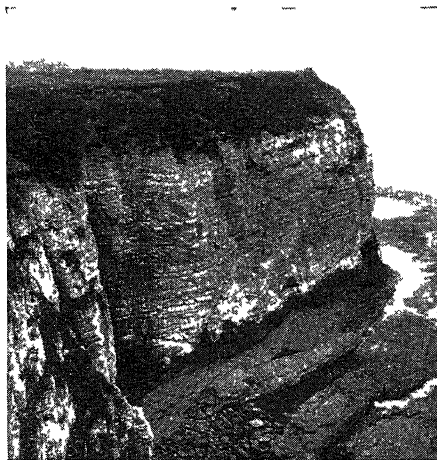


and light A.A. guns, built by the Germans for the defence of cities and other specific targets. Some flak towers in Berlin were over 100 ft. high and had at their base public air-raid shelters. Similar towers, but constructed of steel and mounted on caissons, were set up in the Thames estuary for the protection of ships assembling for convoy. These mounted heavy and light A.A. artillery and were jointly manned by the Royal Navy and the Royal Artillery. They were grouped in fives, being connected by catwalks.

**Flail** (Lat. *flagellum*, little whip). A hand implement for threshing. It is now little used, except on a small scale for flax or when separating peas and beans for seed purposes. It consists of a shaft or handle, commonly made of ash, and a swingle (swiple) of some hard, non-splitting wood. The two are fixed together so that the swingle can move freely, this being effected either by leather thongs or by interlocking an ash swivel on the shaft with a leather loop on the swingle. See Agriculture; Threshing.

**Flambard**, RANULF OR RALPH (d. 1128). The chief minister of William Rufus. Son of a Norman priest, he was made chaplain to the bishop of London, and after William II's accession became his principal adviser, especially in financial matters. In 1099 he was made bishop of Durham. He incurred unpopularity by his extortionate fiscal methods, and after the death of Rufus was imprisoned, but escaped to Normandy, where he became bishop of Lisieux. He returned to England in 1106, after the battle of Tinchebrai.

**Flamborough Head**. A promontory on the E. coast of Yorkshire, England, forming the N. arm of Bridlington Bay. The chalk cliffs, rising to 450 ft., are pierced by a number of caves, and the action of the sea has fashioned the rocks into fantastic shapes. The cliffs are a breeding place for innumerable sea birds, and the collection of eggs in late May and early June is a traditional and perilous local industry, especially in the neighbourhood of Speeton and Bampton, to the N. The lighthouse is 214 ft. above sea level,



Flamborough Head. Promontory on the E. Yorks coast, with chalk cliffs rising to 450 ft.

and its revolving light is visible for 21 m. Flamborough village, largely inhabited by fishermen, is some miles inland. The neighbourhood of the lighthouse has been greatly marred by the indiscriminate building of small houses and bungalows.

**Flamboyant** (Fr., flaming). In architecture, a development of late French Gothic. It owes its name to the flame-shaped openings in tracery which were its chief characteristic. The period of Flamboyant was the late 15th and early 16th centuries. The style hardly penetrated to Great Britain, though some of the flowing tracery in Chester cathedral approximates to it. Among French examples are the church of S. Maclou at Rouen, and part of Tours cathedral.

**Flame**. Gaseous matter raised to a temperature at which it becomes self-luminous, as a result of combustion. Some gases inflame spontaneously because the ignition temperature is as low as the ordinary temperature of the air. Examples are cacodyl, phosphorus dihydride, and zinc ethyl. As a rule, however, the temperature of the gas must be raised before the chemical reaction with the oxygen of the atmosphere takes place. An agency which lowers the temperature below ignition point puts out the flame: a copper helix placed in a candle flame extracts heat so rapidly that the flame is extinguished.

This cooling action is used in the Davy miners' safety lamp, where the wire gauze prevents the flame from being communicated to the inflammable fire-damp in the mine. It has long been known that ordinary flames are hollow and that

there are "solid" flames where the complex molecule of a gas is by combustion broken up into simpler forms, e.g. in burning nitrogen trichloride. Berzelius pointed out that a candle or hydrocarbon flame shows four distinct regions: (1) the dark central region, (2) the yellow region, (3) the blue region, and (4) the faintly luminous portion. The dark portion consists of unburnt gases, whilst the yellow portion occupying the greatest part of the flame is the luminous portion.

The temperature of a flame depends upon the heats of combination of the constituents and the specific heats of the products of the combination. The temperature of sulphur burning in air is comparatively low, whereas an oxy-acetylene flame reaches 2,500° C. Oxidation of substances like phosphorus may give rise to chemiluminescence at low temperatures, and thus to cool flames. The colour of a flame is not as a rule indicative of the calorific power. The yellow gas flame is converted into a hotter non-luminous flame by the admixture of air, such burners, known as Bunsen burners, being used for heating operations in the laboratory and the kitchen.

A sensitive flame is a gas flame produced by a pin-hole burner in which the pressure of the gas has been increased till it is on the point of flaring. This long, thin flame is a sensitive detector of sound waves, particularly of those of high pitch and tiny amplitude. When a train of these sound waves impinges on the sensitive flame it flares and suddenly shortens. See Fire; Heat.

**Flame Cell**. A specialised cell found in many flat-worms (*Platyhelminthes*). It is hollow and is provided with cilia on the inner surface. Excretory products are collected by the cell, passed into its cavity, and wafted down by the cilia to other drainpipe-shaped cells which, joined end to end, provide a passage to the outside. Its name is derived from the flickering motion of the cilia which, seen under a microscope, somewhat resembles the flickering of a flame.

**Flame-flower** OR RED-HOT POKER (*Kniphofia uvaria*). Perennial herb of the family Liliaceae. It is a native of S. Africa. The leaves, which grow in a compact tuft from the root, are long, narrow, and of tough consistency; they are channelled above and keeled below, the keel and the edges finely toothed. The brilliant



Flame-flower or Red-hot Poker

red, tubular flowers are disposed in a close oval spike, at the summit of a stem 3 ft. or 4 ft. high. The aspect of the flowers gives the herb its descriptive name.

**Flamen.** In ancient Rome, a priest devoted to the service of a particular god. The chief of these priests, who had to

belong to the patrician order, was the flamen Dialis or priest of Jupiter. Not only the flamen Dialis himself, but his wife, who was called Flaminica, and the whole household were regarded as consecrated to the god.

**Flame Weapon.** Reservoir of inflammable oil which can be thrown to a distance in the form of a spray of fire. The oil is forced through a nozzle by means of gas or compressed air contained in a subsidiary reservoir and is ignited by a trigger-controlled device fitted to the end of the nozzle. Flame has been utilised as a weapon of war from ancient times. The Greeks had their Greek Fire, and as early as 250 B.C. the Romans devised containers of chemicals which were catapulted amongst enemy troops and ignited into flame upon contact with the ground. A common form of defence was to instal containers of chemicals in front of static military positions and ignite them in the path of advancing troops.

With the development of firearms, flame weapons gradually fell into disuse. They were revived in the First Great War when the Germans introduced the *Flammenwerfer*, a type of blow-lamp originally intended for cutting paths through barbed wire by melting the strands. During the attack on Hooze in 1916 the weapon was used against infantry, and subsequently it was used in trench fighting. Similar flame-throwing equipment was later adopted by the Allied armies. The largest type of flame-thrower held nearly 350 pints of oil, and the smallest 16 pints. A special device was installed on one of the British ships in the raid on Zeebrugge.

Germany continued the development of flame-throwers and

used them in large numbers when she invaded Poland in 1939 and France in 1940. She introduced the tank flame-thrower, pressure from the engine giving the jet, which had a temperature of 2,000° C. and a range of 100 yds. Italy had flame-throwers mounted on Ansaldo tankettes. Russia installed them in the modified 6-ton tank which she used against the Mannerheim line in the Russo-Finnish campaign of 1939-40.

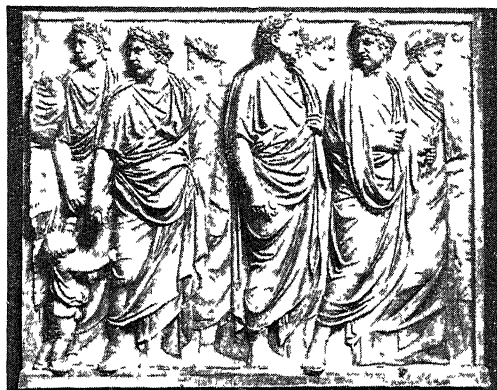
The British army had no flame-throwers in France in 1940, but shortly after the evacuation of the army from Dunkirk there was formed a petroleum warfare department to develop the application of these weapons, chiefly as a

flame traps; these consisted of perforated pipes laid down each side of a coastal gap and fed from underground reservoirs so that burning oil could be sprayed over the whole area.

A development of the old-time fougasse, or mine, which discharged oil instead of metal, and a hedgehog fougasse which could be hidden behind a wall or rise in the ground and electrically fired to jump over it and burst into flame, were used in conjunction with the anti-tank traps dug throughout Great Britain. When erected vertically, these weapons projected a flame 200 ft. into the air, and when laid along the ground shot blazing oil to 150 ft.

at a temperature of 1,500° C. For the defence of aerodromes, a flame-throwing armoured car was developed; it projected flame vertically or along the ground. The Germans took such a serious view of these weapons that many troops training to take part in the invasion were equipped with asbestos suits.

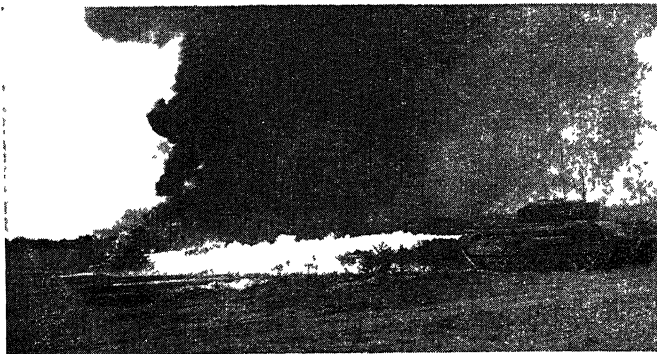
In 1942 the petroleum warfare department began experimenting in the design of mobile flame-weapons for the eventual Allied invasion of the Continent. No hint of possession of these weapons was allowed to escape until D-day, when they burned and blasted their way through the defence. The heaviest of them was the Crocodile. The nozzle and controls were mounted in a



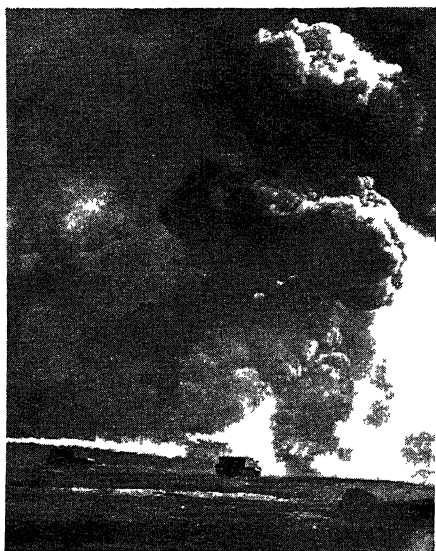
Flamen. Members of the College of Flamines, from the Altar of Peace set up in Rome by Augustus  
Uffizi Gallery, Florence

defensive measure against the threatened German invasion. A "sea flame barrier" was set up at vulnerable points on the S. coast by piping oil out to sea beyond the low tide mark to form surface pools that could be fired by passing through the pipes a chemical which ignited on contact with sea water. Gaps on rocky parts of the coast were protected by deile

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Flame Weapon. The Crocodile, a flame-thrower fitted to a Churchill tank, firing low to obliterate an objective



Flame Weapon. Wasp flame-throwers attacking in line abreast, risking the danger from one another's flame jets

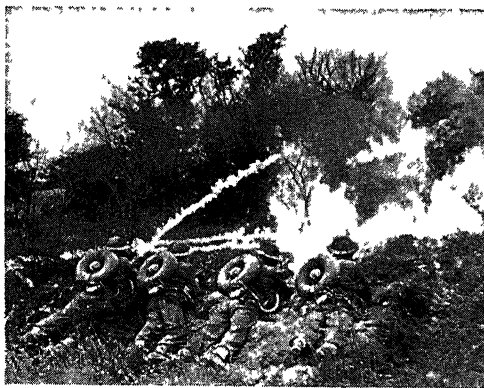
Churchill tank, and the fuel was carried in an armoured trailer and transferred to the tank at a pressure of 300 lb. per sq. in. through an armoured pipe incorporated with the towing link. The link made it possible for the trailer to be towed over any ground that the tank would travel over. The jet had a range of nearly 200 yds.

For close infantry support, the Wasp was evolved. With a range of 150 yds., it was fitted to a standard Bren carrier, the fuel and compressed gas tanks being also carried thereon. Projectors and tanks were easily removable, should it be necessary for the carrier to resume its normal rôle. The Lifebuoy flame-thrower was an infantry weapon, carried into action on a man's back. It had a ring-shaped container for the fuel and a spherical container for the compressed gas. The flame was projected from a hand-gun which incorporated an igniting mechanism. The Lifebuoy had a range of 50 yds. and was frequently used by parachute troops. These three British flame-throwers could fire round corners, as the fuel ricocheted

and produced fierce fires in nooks and corners of pill-boxes and trenches. Apart from their capacity for physical devastation, they had a powerful psychological effect. See also Incendiary Weapons.

**Flamingo** (*Phoenicopterus*). Order of large birds, nearly related to the ducks. They have extremely long legs and necks, rosy or scarlet plumage with black on the wings, and beaks sharply bent down at an angle. Adult specimens sometimes exceed 6 ft. in height. One European species, four or five American, and one African are known.

Flamingoes are wading birds, as their long legs and necks suggest, and are found in great flocks by the margin of lakes and rivers, feeding on molluscs and aquatic vegetation. When feeding, the flamingo's head is turned upside down and the curved beak acts as a scoop for picking up food. The birds are fairly strong in flight, and can swim well. The nests are made of mud, and when built on land rather resemble large soup plates. When constructed in the water, they are tall and conical. The European flamingo is common in the S. of France and in Spain during the nesting season, and it ranges through many parts of Africa. It is rarely seen in Great Britain. The name is from Span. *flamenco*, derived from Lat. *flamma*, flame, in reference to the bird's colour.



Flame Weapon. [Troops equipped with Lifebuoy flame-throwers attacking the enemy concealed behind a hedge

**Flaming Onions.** Incendiary shells used primarily with a view to setting aircraft on fire. The incandescent projectiles are strung together and resemble a string of glowing onions.

**Flaminian Way** (*Via Flaminia*). Ancient Roman road. It took its name from G. Flaminius, censor in 220 B.C., who extended it to Ariminum, making it the first Roman road to cross Italy. Previously it had existed only as far as Spolegium. It issued from Rome at the Porta Flaminia, being a continuation of the Via Latina, and, crossing the Tiber by the Milvian bridge, reached Spolegium by way of Narnia.

**Flamininus, TITUS QUINCTIUS** (d. c. 175 B.C.). Roman general. Before he was 30, he attained the consulship, and in 197 B.C. defeated the Macedonians at Cynoscephalae (q.v.). A clever diplomatist and an



Flamingo. Adult specimens of the European flamingo

admirer of the Greeks and their culture, he was appointed to settle the affairs of that country. At the Isthmian games in 196 he proclaimed amidst great enthusiasm the independence of Greece, really the exchange of a Roman for a Macedonian master. After crushing the Spartan tyrant Nabis, he was honoured by a splendid triumph on his return to Rome in 194. In 192 he was again in Greece and prevented the pro-Syrian party from assisting Antiochus in his struggle against Rome. In 183 Flamininus was sent to demand the surrender of Hannibal from Prusias, king of Bithynia.

**Flamininus, GAIUS** (d. 217 B.C.). Roman statesman. He introduced an agrarian law in 232, providing for the distribution of recently conquered territory in Picenum and Senonian Gaul among the plebeians. During his censorship

in 220 he built the great Circus Flaminius and extended the Flaminian Way (*q.v.*). He was one of the generals in command of the Roman army at the battle of the Trasimene lake in 217, in which he was slain.

**Flammarion, CAMILLE** (1842-1925). French astronomer. Born Feb. 25, 1842, at Montigny-le-Roi,



*Flammarion*

he studied theology at Langres and Paris. In 1858 he entered the Paris observatory, and was a member of the Bureau des Longitudes in 1862. From 1863 he edited *Cosmos* and *L'Astronomie*. He carried out numerous observations, especially on Mars, at his private observatory at Juvisy. He won wide fame as a popular writer on astronomy, and founded the astronomical society of France in 1887. Among his books translated into English are: *Popular Astronomy*; *Astronomy for Amateurs*. He died June 4, 1925.

**Flammenwerfer**. The German name for a type of flame-thrower first used at Hooze in 1916. *See* Flame Weapon.

**Flamsteed, JOHN** (1646-1719). An English astronomer. Born at Denby, Derbyshire, Aug. 19, 1646,

he was educated at Cambridge. From 1684 he held the benefice of Burstow, Surrey. Devoting himself early to the study of astronomy, he was appointed king's astronomer in 1675, with an annual salary of £100, and installed eventually at the new Greenwich observatory, begun in that year. His observations there gave Newton much help in the perfecting of his lunar theory, though there was much ill-feeling between the two men. Flamsteed's chief work was the great catalogue of the fixed stars, the origin of all later catalogues, which was incomplete at his death on Dec. 31, 1719, but was published with his other observations in 1725. This work was edited by F. Baily, 1835.

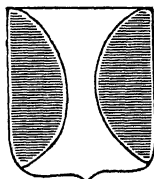


*John Flamsteed*

**Flanagan and Allen**. British music-hall comedians. Robert Winthrop (who adopted the name of Bud Flanagan), born Oct. 14,

1896, and (William Ernest) Chesney Allen, born April 5, 1894, first appeared together in a revue entitled *Us* in 1926. They evolved a type of verbal humour which found full scope in the *Crazy Gang*—an entertainment first given in 1931. Allen retired from the act in 1946. They also wrote and sang sentimental songs, of which *Underneath the Arches* was typical.

**Flanches** OR **FLANQUES**. In heraldry, the dexter and sinister sides of a shield cut off by curved lines, giving the middle an hour-glass form. They are usually borne in pairs, and are classed among the sub-ordinaries (*q.v.*).



Flanches, in heraldry

**Flanders.** That part of the Low Countries which is bounded roughly by the lower reaches of the river Schelde, the Lys valley, and the coast from Calais to the Schelde estuary. The political frontiers of Flanders have varied considerably, but most of this territory now lies in Belgium, and the old name is retained in the two provinces of W. Flanders (*Flandre Occidentale*), and E. Flanders (*Flandre Orientale*). The Flemish provs. are markedly different in character from the Walloon provs. of Belgium, being mainly peopled by peasant Flemish stock, most of whom speak Flemish, a Teutonic language closely akin to Dutch. Ethnologically, a large part of the French dept. of Nord is Flemish, and is often referred to as French Flanders; while that part of the Netherlands between the Schelde estuary and the frontier with Belgium is known as Zeeland Flanders. The chief towns of W. Flanders are Bruges, Courtrai, Ostend, Roulers, Mouscron, Thielt, Furnes, Ypres, Dixmude; of E. Flanders, Ghent, Alost, Audenarde, Eecloo, St. Nicolas, Termonde. W. Flanders, area, 1,248 sq. m.; pop. est. 978,645. E. Flanders, area, 1,147 sq. m.; pop. est. 1,208,265.

The original inhabitants of Flanders were known to the Romans as the Menapii and the Morini, whom they conquered about 51 B.C. During the 7th century Christianity was introduced, chiefly by S. Bertinus, S. Omer, and S. Bavon. The treaty of Verdun, 843, by which the empire of Charlemagne was partitioned among his sons, gave the greater part of Flanders to Charles the Bald of the W. Franks. Finding this part of

his dominion constantly harassed by the Northmen or Normans, he entrusted its defence to Baldwin Bras-de-Fer (Iron-Arm), who founded the historic line of the counts of Flanders. The last of the direct line, Baldwin VII, died in 1119, and Flanders passed to his cousin Charles, called the Good.

In 1157 Count Thierry resigned in favour of his son Philip, who ruled with marked success, being largely responsible for the early economic prosperity of the great Flemish market towns of Bruges, Ypres, Ghent, etc., and who died crusading at Acre, 1191. He left his Flemish dominions to his sister Margaret of Hainault, who thus united the crowns of Flanders and Hainault, though ceding Artois to Philip Augustus of France. Her son, Baldwin IX (1171-1205), emperor of Byzantium, succeeded her in 1194. His daughter, Joanna, was married to Ferdinand of Portugal, who resisted the suzerainty of France, but was disastrously defeated by Philip Augustus at Bouvines, 1214.

After Joanna's death, 1244, the kingdoms of Flanders and Hainault were torn by a war of succession, and were eventually separated by the arbitration of S. Louis, who awarded Flanders to William of Dampierre, and Hainault to his stepson, John of Avesnes, 1246. Guy of Dampierre, who succeeded in 1280, waged war, in alliance with Edward I of England, against Philip the Fair of France. Supported by popular feeling, directed by the Flemish patriots, Deconinck and Breydel, he routed the strong force of French knights near Courtrai, 1302, and for a time Flanders was definitely free from France. But under Louis of Nevers, 1322-46, it was again virtually a French fief.

#### Resistance to French Rule

The following period of internal dissensions was marked chiefly by the resistance of the Flemish communities to the arbitrary and extortionate rule of Louis II of Mâle, who succeeded in 1346. John and Philip van Artevelde (*q.v.*) hold a great place in Flemish history as spokesmen and leaders of the popular party, or White Hoods. By the autumn of 1382 Philip had become very powerful in W. Flanders, established in Bruges, and assured of the people's support. But at Roosebeke, Nov. 27, 1382, he was utterly defeated by Louis with the aid of Charles VI of France. Thenceforth Louis ruled with a firm hand until his death, 1385, when Flanders fell to

his daughter Margaret, wife of Philip the Bold of Burgundy.

From this date Flanders was for historical purposes part of Burgundy, until, in 1477, Mary of Burgundy married the emperor Maximilian and brought it into the empire. It was in this period that the extraordinary economic prosperity of the great Flemish towns reached its highest point. The abdication of Charles V brought Flanders into the Spanish dominions under Philip II in 1555, introducing the long wars for the independence of the Netherlands, and the old-time prosperity suffered sadly. In 1648 the treaty of Westphalia made Flanders part of the United Netherlands, and in 1659 and 1713 Louis XIV absorbed large parts of Flemish territory as well as Artois. In 1714 the treaty of Rastatt put Flanders again into Austrian possession, and in 1794 it fell into French hands once more. But when the new kingdom of Belgium was formed in 1830, Flanders entered into her present position therein.

Neither these many changes of sovereignty, nor the unfortunate position of Flanders as a battlefield of the nations, has destroyed the individual character of the Flemings or their country. Within Belgium itself racial consciousness is sharply marked. The possession of a tongue and literature of their own has given the Flemish national movement considerable strength. It has won recognition of Flemish rights, linguistic and educational, and is an important factor in Belgian politics. A strong body of feeling has long favoured Flemish autonomy.

**Flanders, BATTLE OF.** Name given to one of the final battles of the W. front in the First Great War which brought about the military defeat of Germany by the Allies. It was fought Sept. 28–Nov. 11, 1918. The heavy fighting in Flanders in 1914, sometimes called the 1st battle of Flanders, is more generally known under the titles Ypres and Yser. In the Second Great War, the Allied campaign in Flanders of May, 1940, which ended in the retreat upon Dunkirk, was also described as the battle of Flanders in the title of a popular semi-official account published the following year, but is dealt with in this work under British Expeditionary Force.

In 1918, in accordance with the general plan of Foch, the Allied c.-in.-c. a group of Belgian, British, and French armies was

placed under command of the king of the Belgians, and opened an attack on a front extending from Dixmude to the S. of the Ypres salient on the morning of Sept. 28. In spite of heavy rain, by Oct. 1 all the German main defensive line on the Flanders front was penetrated to a depth of over 8 m. The Germans at once began preparations for the evacuation of the Flanders coast, which they had at one time decided to annex permanently.

After a pause for reorganization the Allies resumed the attack on Oct. 14; and a slow German retreat along the whole front continued up to the date of the armistice, Nov. 11. The Allied troops had to march and fight with German rearguards in difficult country with bad communications. Mines with delay-action fuses were left by the Germans at every cross-roads and at many points on the railways, and these exploded sometimes weeks after their retirement. In the first phase of the battle some 10,000 German prisoners were taken; in the second phase, some 18,000.

**Flanders Poppy.** Artificial flower sold on Remembrance Day, originally Nov. 11 (sometimes called Poppy Day) to support Earl Haig's appeal fund for disabled ex-Servicemen. The scarlet wild poppy grows in such profusion in Flanders that it was chosen as the commemorative emblem of this fund, which was founded to aid ex-servicemen of the First Great War. See Armistice Day.

**Flandrin, EUGÈNE NAPOLEON** (1809–76). French painter. Born in Naples, Aug. 15, 1809, he studied in Italy, and under Horace Vernet in Paris, and travelled widely in the East. He painted many landscapes, notably of Venice, Athens, Algiers, and Constantinople, and wrote valuable accounts of his travels and archaeological discoveries. He was awarded the Legion of Honour in 1842, and died Feb. 15, 1876.

**Flandrin, PIERRE ÉTIENNE** (b. 1889). French politician. He was born in Paris, April 12, 1889, educated at its university, and entered the legal profession. In 1914 he was elected deputy for Yonne, and later held many cabinet appointments, being prime minister in 1934–35 and foreign minister in 1936. Of the moderate Right and with industrial and financial connexions, he worked for a rapprochement between France and Germany and was in favour of terminating the alliance with Great

Britain. After the capitulation of France in June, 1940, Flandrin retired to the German-occupied



P. E. Flandrin,  
French politician

area, but in Dec. was appointed foreign minister in the Vichy government. He resigned Feb. 9, 1941. Arrested in Algeria, Oct. 8, 1944, he was interned in Fresnes prison, near Paris, and on March 1, 1945, the high court ordered the sequestration of all his property. In 1946, Flandrin was found guilty of "national indignity" by participating in the Vichy government and was sentenced to five years' loss of civic rights; but was at once exonerated in view of his past services to the resistance movement.

**Flandrin, JEAN HIPPOLYTE** (1809–64). French painter. Born at Lyons, March 23, 1809, son of a miniature painter, he studied there and at Paris under Ingres (*q.v.*). Obtaining the Grand Prix in 1832, he went to Rome, whence he returned in 1838 to Paris, and was employed in the mural decoration of S. Séverin, 1841, S. Vincent-de-Paul, 1850, and other churches at Paris and elsewhere. Later he took to portrait-painting, among his best works in this genre being the full-length portrait of Napoleon III, at Versailles. He died of smallpox at Rome, March 21, 1864.

**Flandrin, JEAN PAUL** (1811–1902). French painter. A brother of J. H. Flandrin, he was born at Lyons, May 8, 1811, and studied under Ingres. He was a prolific artist, his best work being of landscapes. Among the most noteworthy are *Solitude in the Sabine Mountains*, 1852, in the Luxembourg, Paris; *The Rhône*, 1857; *Meadow near Mantua*, 1874; and *Diggers at Work*, 1884. He was awarded the Legion of Honour in 1856, and died March 10, 1902.

**Flange.** A projection which guides, strengthens, or affords a means of attachment. Flanges are used for a number of purposes, the designs taking many forms. To prevent lateral movement of a belt or rope the wheels over which it runs are often provided with circumferential flanges. A similar method is adopted for wheels running on rails, with the important difference that it is the travelling member which is flanged. Flanges may also be suitably positioned, to

give additional strength to steel beams and girders. A further purpose is that of joining two individual members of a structure, e.g. water and gas pipes. In railway wheels the flanges are forged to shape, but for the production of girders or beams they are formed by hot rolling between rolls. Casting is a third method used in the production of the component itself, e.g. flanges on cast iron pipes.

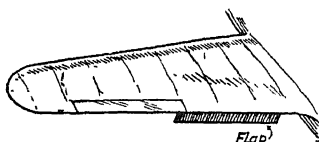
**Flank.** Military term used for the side of a unit, whether in column, line, mass, or any other formation. On the march troops are protected by flank guards, and when taking up a position by outposts, unless the nature of the ground makes an attack impossible. See Tactics.

**Flannan Isles.** Cluster of seven small islands in the Outer Hebrides, Ross and Cromarty, Scotland. Called also the Seven Hunters, they lie 16 m. W.N.W. of Gallon Head, Lewis Island, and contain many Caledonian remains. They are the Insulae Sacrae of Buchanan. Large numbers of sea-fowl frequent them. Flannan Isle is the title of a poem on the supernatural by Wilfrid Gibson.

**Flannel.** Soft woollen cloth used for clothing, blankets, etc. Highly absorbent, it is eminently adapted for wearing next the skin. The word is probably of Celtic origin (*cf.* Welsh *gwlan*, wool). Wales is the original home of the flannel industry, and has long held flannel fairs. Falstaff calls Sir Hugh Evans the "Welsh flannel." Welshpool, Montgomeryshire, formerly the chief seat of the manufacture, has been superseded by Newtown. Lancashire and Yorkshire are noted for flannels, particularly Rochdale. See Blanket.

**Flannelette.** Cotton imitation of flannel, used for pyjamas, underwear, etc. The term was first used towards the end of the 19th century. Flannelette has lost much of its former popularity as it lacks the absorbent properties of flannel, and is liable to catch fire.

**Flap.** Device fitted to aircraft wings to enable high-speed machines to land on constricted aerodromes. Flaps are fixed to the trailing edge of the wing and are hinged to move downwards. When down they offer resistance to the air and so act as a brake upon forward movement. In normal flight the flaps are kept in the same plane as the wing surface and are controlled by a lever in the cockpit. Dive-bombers are fitted with large flaps to check downward momentum during the dive (*see* Dive



Flap fitted to aircraft wing

Brake). By a combination of flaps and slots, the slots being fitted to the leading edge of the wing, a high-speed aircraft can be flown safely at remarkably low speeds. The slots smooth out the airflow over the upper surface of the wings, while the flaps give an increase in lift.

**Flare.** Fireworks of the nature of coloured fires. They were used during the Great Wars and in later operations, e.g. in Greece, to illuminate portions of the front at night, and sometimes arranged so that they were automatically ignited if anyone moving about stumbled over a trip wire placed in front of the position. Screens were arranged behind the flares so that the enemy troops were illuminated, while their opponents remained in the shadow and were not inconvenienced by the light. Small hand flares of the Very light (*q.v.*) type were used for both illumination and signalling, and generally burned for about three minutes. Larger ones were thrown from trench howitzers. During the Second Great War flares were dropped from aircraft by parachute to illuminate targets during bombing attacks. Flares intended to illuminate the ground usually contained a mixture of powdered magnesium and a chlorate or nitrate of one of the alkali metals. They gave an intense white light, throwing strong shadows. Life-buoys usually have attached to them a canister of chemicals which automatically ignite on contact with water and emit a bright yellow flare. Signal flares of various colour are obtained from such constituents as the following, combined in the proportions shown.

	Red	Green	Blue	Yellow
Potassium chlorate ..	78	—	45	—
Strontium carbonate ..	15	—	—	—
Shellac ..	7	1	5	—
Barium chlorate ..	—	66	—	—
Milk sugar ..	—	33	—	—
Sodium nitrate ..	—	—	—	70
Sulphur ..	—	—	—	20
Antimony sulphide ..	—	—	—	7
Lampblack ..	—	—	5	3
Basic copper carbonate ..	—	—	10	—
Calomel ..	—	—	85	—

**Flare Path.** Lights set along the edge of a runway or laid out to form a path on an airfield to enable aircraft to land at night. On permanent runways the lights are set flush in the ground on either side of the tarmac and lit electrically. On temporary airfields the flare path is lit by portable oil lamps. It is always lit or laid out so that the pilot comes in to land into the wind, coloured lights giving him his direction.

**Flash.** Piece of broad black silk ribbon with long ends, which is attached to the back of the tunic



Flash. Distinctive emblem worn by the Royal Welsh Fusiliers

collar of the Royal Welsh Fusiliers. This is a relic of the days when soldiers wore their hair powdered and tied in a queue; the flash served to keep grease from soiling the back of the tunic. During

both Great Wars the term flash was applied to the strips of printed or embroidered or coloured material worn on the shoulders of army tunics or blouses to denote regiments and formations. Dominion servicemen and Allied subjects serving with the British services in the Second Great War wore shoulder flashes indicating their dominion or nationality. Flashes worn by civil defence personnel denoted their particular functions.

The term is also used for the tasselled end of the strip of material used as a garter in Highland dress.

**Flash Bomb.** Missile to assist air-to-ground photography, developed during the Second Great War. The R.A.F. used 1,000,000 candle-power cartridges for low altitude photography purposes and 200,000,000 c.p. flash bombs for greater heights. Night photography by the U.S.A.A.F. was carried out at still greater heights with 700,000,000 c.p. flash bombs, a large area being photographed with a single exposure lasting about  $\frac{1}{10}$  sec.

**Flashlight Photography.** Photography by the brilliant light obtained by burning magnesium. It is used chiefly for portraits, groups, and interiors of moderate size. In one apparatus fine magnesium is blown through the flame of a spirit lamp, but the magnesium is usually combined with chlorate or perchlorate of potash, and fires readily on the application of a taper or electric spark. The



chief drawback to these "flash-powders" is the smoke which is produced by them. To overcome this defect, photo-flashes or flash bulbs have been produced consisting of a bulb containing magnesium foil in an atmosphere of oxygen and other gases. An instantaneous flash is produced by the rapid combustion of the magnesium foil, giving an intense white light of 25,000-55,000 lumen-seconds. The flash is initiated by a small filament heated momentarily by an ordinary dry cell. Flash bulbs, which can be used only once, are arranged to screw into a pocket torch.

**Flash Point.** Temperature at which a substance gives off sufficient vapour to form an inflammable mixture with air. The test is specially applied to petroleum products and is indicative of volatility and fire hazard. The substance under test is contained in a metal cup which is evenly heated at a stated rate. A small test flame is applied at regular intervals to the vapour space in the cup until a bluish flame appears; the temperature of the substance at that instant being recorded as the flash point. Heating may be continued until such time as the vapour burns continuously for at least 5 secs.; the temperature of the substance then is recorded as the fire point. A lower figure will be obtained if the cup is fitted with a cover than if it is open.

Standardisation of apparatus and procedure is essential. In Great Britain the Abel tester is specified for substances with flash points below 120° F. and the Pensky-Martin apparatus for substances flashing above that temperature. A minimum flash point

(Abel, closed cup) of 73° F. is demanded for kerosene by the British Petroleum Act. The minimum for fuel oils is usually 150° F. (Pensky-Martin, closed cup). This minimum is specified so that an inflammable liquid is safe in its normal conditions of storage and use. Recognition of the nature of the liquid is as important in avoiding the danger of explosion and fire as is compliance with statutory standards.

**Flash Spectrum.** Transient spectrum of the sun's atmosphere, first observed at the total eclipse of 1870. As the moon moves across the narrowing crescent of the sun's disk, the absorption spectrum of the solar surface gives way to a bright-line spectrum which flashes out for a few seconds until the sun's atmosphere, too, is covered by the moon. The reverse phenomenon happens a few minutes later when the moon uncovers first the sun's atmosphere and then the bright disk itself. Study of the flash spectrum enables the physical condition as well as the chemical composition of the sun's outer layers to be deduced.

**Flask.** (1) In founding, a wooden or iron box or frame-like structure for holding the sand or material forming a mould into which molten metal is poured for making a casting in a foundry. The flask comprises a cope, or top member; a drag, or bottom member; and, when used, intermediate members termed cheeks. If the mould is contained in two or more members, the structure is known as a two-part flask, a three-part flask, etc.

(2) Vessel of glass, metal, etc., usually having a neck, and provided with a body portion which

may assume a variety of shapes, for use in storing and heating liquids, and, formerly, as a receptacle for gunpowder.

(3) In ordnance, a metal reservoir for storing compressed air which forms the actuating medium of a motor for an automobile torpedo.

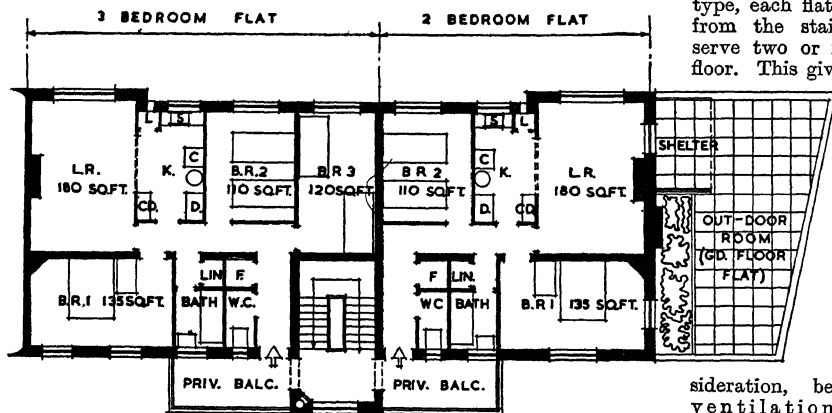
**Flat.** Separate residence, one of several, each at one level, in a single building. Where the planning arrangements are similar but the accommodation of each dwelling is on more than one floor, the dwellings are called maisonnettes. Blocks of flats or maisonnettes fall into two main classes: (1) those provided by local authorities, voluntary planning associations, or housing trusts, the rents being artificially reduced by subsidy; (2) commercial flats built and let on a profit-making basis.

Living in flats has now become an accepted feature of British social structure, for ownership of a house with its own garden is often precluded by the need to live near the centre of a large town. In areas populated by, say, 150 persons per acre, housing is normally possible only in flats. The siting of blocks is important. There must be ample space between them to avoid overshadowing, and to provide sufficient sunlight, fresh air, and open space. Blocks running N.-S., with windows facing E. and W., provide the best arrangement. Ideally bedrooms and kitchens should be on the E. and living rooms on the W.

The balcony access type is probably the most economical in cost, particularly where lifts are installed, access to each flat being from a long external balcony at each floor. In the direct access type, each flat is entered directly from the staircase, which may serve two or more flats at each floor. This gives a greater degree

of privacy, better ventilation, and more sunlight. The corridor access type, in which the flats are approached from each side of an internal corridor, is more suited to hotel planning than to flats, built commercially with

profits a first consideration, because mechanical ventilation, with increased capital and maintenance costs, is generally necessary for the corridors.



Flat. Architect's lay-out of the first floor plan of a three-storey block of flats, showing the advantages of the balcony access type; each of the adjacent flats is entered through a private balcony from a common staircase

The limit of heights of individual blocks is controlled by legal limitations and by the cost of construction. Hitherto the majority of blocks provided by local authorities have been of five storeys, the lowest three floors being planned as flats and the upper two as maisonnettes. Cost increases disproportionately above eight or nine storeys, but buildings six or seven storeys high are likely to be common. Lifts may be provided in blocks of more than three storeys built by local authorities under the terms of the Housing Act, 1946. Sites on main roads often have shops on the ground floor. Gardens, children's playgrounds, and accommodation for communal activities are desirable features of large estates.

Social changes have rendered obsolete many large houses originally intended for single families, but many of sound construction have been converted into flats. Large detached or semi-detached houses are usually comparatively easy to deal with. For terrace houses it is better to convert a number together, uniting the buildings at each floor level by breaking through the party walls. Redundant staircases can then be removed.

**Flat.** In music, a sign ( $\flat$ ). It indicates that the note to which it refers is to be a semitone lower in pitch than the ordinary note of the same alphabetical name or in the same position on the stave. It was first applied to the note B, and the sign was actually a little b, to distinguish this note from  $\sharp B$ , which in Germany was and is still called H ( $\sharp = h$ ). See Double Flat; Natural; Semitone; Sharp.

**Flatbush.** District of Brooklyn, U.S.A., one of the boroughs of King's co., Long Island, it became part of the borough in 1898. It was settled by the Dutch in 1651. On Aug. 23, 1776, Lord Cornwallis's division of Lord Howe's army occupied Flatbush, and the battle of Long Island fought four days later is sometimes called by this name.

**Flateyjarbok.** Icelandic manuscript dating from the 14th century. Among other things it contains some account of the voyages of the Norsemen of the 10th and 11th centuries to the American continent. Flateyjarbok (the Book of Flatey) is preserved at Copenhagen. Consult Anecdotes of Olave the Black, J. Johnstone, 1780; Flateyjarbok, ed. G. Vigfusson and C. R. Unger, 1860-68.

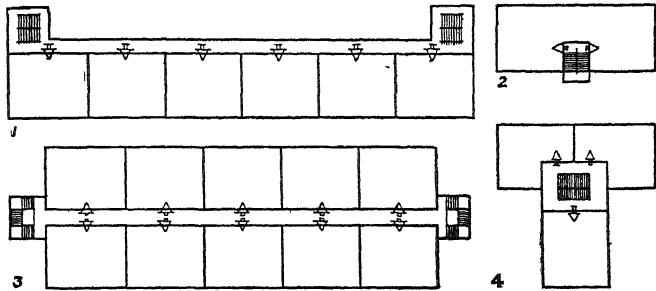


Fig. Plans showing different means of access: 1, balcony access; 2, direct access, twin type; 3, corridor access; 4, direct access, multiple type

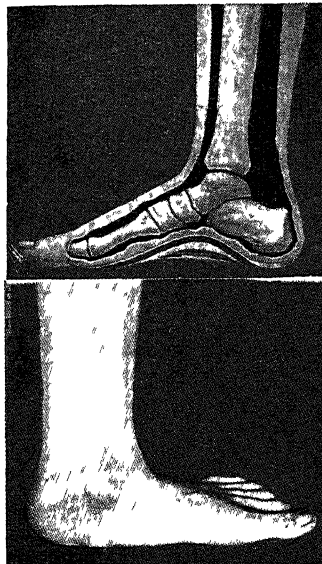
**Flatfish** (*Pleuronectidae*). Large group of fishes of flattened shape, in which the two sides are unlike in colour and the two eyes are on one side. The plaice and sole are examples. In these fish the body is greatly compressed laterally. In early life the flatfish are symmetrical, and swim like round fishes. Then they become flattened, the body tilts over, and the fish takes to swimming on its side and to lying on the bottom of the sea. The upper side then becomes darkened, and assumes a hue which approximates to the nature of the ocean bed on which it lies, while the markings closely resemble the gravel and mottings of the sand or mud. At the same time, the eye on the under side gradually works round to the upper surface and the mouth becomes more or less twisted. The eyes stand out from the head and

can be turned independently in different directions. Flatfish are marine in habit, though flounders frequently ascend rivers, and a few species have adapted themselves to a life in fresh water. Most are good table fish.

**Flat Foot.** In mankind, a condition in which the arch of the foot is reduced, or in bad cases nearly abolished, so that almost the whole extent of the sole comes in contact with the ground. Flat foot is most common in young persons of poor physique, whose occupation has necessitated their standing for long periods, or frequently carrying heavy weights. Occasionally it may result from injuries which have torn or weakened some of the ligaments of the foot.

Flat foot produces feelings of fatigue and weakness after a comparatively small amount of exercise. Irritability and headache result from jarring of the brain pan, the transmission of which jarring through the spinal column is prevented by the spring of the normal arch. Severe pain may be felt in the sole, and the gait becomes shuffling and awkward. Eventually the whole posture of the body may be altered, particularly when the condition is more marked in one foot than in the other. Compensatory changes may result in a tilting of the pelvis, curvature of the spine, and even changes in the position of the shoulders.

In early cases, where weakness rather than actual deformity of the arch is present, rest should be enjoined; at the same time the patient should undergo a course of instruction in exercises specially designed to strengthen the weak parts. Electrical stimulation of the muscles helps. When the condition is more marked it is necessary to afford artificial support to the arch of the foot by instep-pads worn inside the shoes,



Flat Foot. Illustration of a severe case. Upper diagram shows the foot with corrective apparatus supporting the arch

or by raising the inner part of the shoe sole. These measures, however, merely relieve the symptoms, and have no curative power. In chronic cases, remedial measures may prove useless, though a surgical operation may relieve the condition. *See Foot.*

**Flatford.** Village of Suffolk, England, on the Stour near the Essex border. Its fame rests on its mill, which formed the subject of a picture by John Constable. The mill-house, restored, was presented to the National Trust in 1928 and in 1946 was leased by the Council for the Promotion of Field Studies.

**Flatman,** THOMAS (1637-88). English miniaturist. He was born in London, and educated at Winchester and New

College, Oxford, of which he was scholar and fellow. He became a barrister and practised poetry and miniature painting as an amateur, the latter with conspicuous success. Walpole cites a portrait of Dr. Tooke's father by him which was highly praised by contemporary connoisseurs. He died Dec. 8, 1688.

**Flattery.** Cape or promontory of Washington, U.S.A. At the S. side of the entrance to the strait of Juan de Fuca, it is the extreme N.W. point of the state. There is another cape of this name in Queensland, Australia, in Banks co. about lat. 14° 52' S.

**Flatulence** (late Lat. *flatulentus*, full of wind). Term describing an undue amount of gas in the stomach or intestines. In the normal digestive tract anything over the normal amount of gaseous product is absorbed by the lining mucous membrane; flatulence can be caused by hysteria, a wrong balance of acid and alkali, inadequate secretion of bile, or mechanical blockage causing a reflex hold-up of the intestinal contents. Much flatulence travelling in an upward direction nearly always implies air-swallowing; many hysterical women habitually swallow air. Gas may occur from fermentation in the lower part of the digestive tract when the bile is unable to discharge its anti-bacterial function. The food-stream may be too acid or too alkaline. A duode-

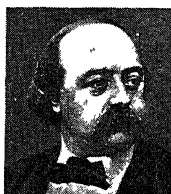
nal ulcer, an inflamed appendix, a haemorrhoid, or any new growth of the intestinal tract may give rise to this condition.

Relief is obtained by removing any mechanical cause and adjusting food intake and the rate and time of intake so as to correct any chemical imbalance. The importance of adequate biting surface for the teeth cannot be overstressed.



Flatford, Suffolk. Mill on the river Stour, subject of a famous painting by Constable, and now the property of the National Trust

**Flaubert,** GUSTAVE (1821-80). French novelist. Born at Rouen, Dec. 12, 1821, the son of a surgeon, he went to Paris to study law in 1840, but spent a number of years in travel, visiting the East in 1849-50. Returning to France in 1850, he settled at Croisset, near Rouen, and began his first novel,



*Madame Bovary*. It took six years of constant labour and was published serially in 1857. An action against author and publisher for its alleged immorality was dismissed, and the book, his undoubted masterpiece, made his name famous. There followed an epic story of Carthage, *Salammbô* (Eng. trans. M. F. Sheldon), 1862; *L'Éducation Sentimentale*, a survey of contemporary life, 1869; *La Tentation de S. Antoine* (Eng. trans. R. Francis), 1874; *Trois Contes*, 1877; and the posthumous *Bouvard et Pécuchet*, 1881. Flaubert died May 8, 1880, having long been broken in health.

He was the dominant figure among French novelists of the last epoch of Romanticism. A literary

descendant of Balzac, he was by turns a sheer realist and a sheer romanticist, in both aspects brilliant and infinitely laborious. He took his art very seriously, tormenting himself for days in the search for a word, polishing his work with untiring zeal. His technical skill, especially as a realist, greatly influenced later French writers, in particular the de Goncourts and Zola. An edition of his works in 18 vols. was completed in 1910. There are Lives by E. Faguet, 1899; J. Wassermann, 1906; L. Bertrand, 1912. *Pron.* Flo-bare.

**Flaveria contrayerba.** Biennial herb of the family Compositae. A native of Peru, it has opposite, saw-toothed, lance-shaped leaves, and yellow flower-heads. In Chile a yellow dye is obtained from them.

**Flavine** (Lat. *flavus*, yellow). Complex organic substance used as an antiseptic. Its value was discovered in 1916 by the Bland-Sutton institute for clinical pathology at the Middlesex Hospital, London. The discovery of the drug itself was due to Prof. Ehrlich, who treated cases of sleeping sickness with it. Flavine is a yellow dye belonging to the acridine series, hence its official name acriflavine. It is harmless to the tissues, though it may sometimes form scars. The discovery of its efficacy as an antiseptic was hastened by the need for such a drug occasioned by the First Great War. *See* Antiseptics.

**Flax** (*Linum usitatissimum*). Annual plant of the family Linaceae. Its native country has not been decided with certainty; there appear to be at least two centres of origin, S.W. Asia, to which a small flower and small seed form are peculiar, and the countries on the S. shores of the Mediterranean, where a large flower and large seed form predominate. The form known in the British Isles



Flax. Stem, leaves, and flowers of *Linum usitatissimum*

and other countries where flax is grown for its fibre is a fine unbranched erect plant, 3-3½ ft. high, with small alternate lanceolate leaves and usually blue flowers; the fruit is a spherical capsule with five compartments each containing two brown, lens-shaped seeds. Although the flowers are usually blue, with blue or yellow pollen grains, there are fibre varieties with white flowers and either blue or yellow pollen grains.

When intended for high quality fibre, the plant is pulled by up by hand or by mechanical means, and tied in small bundles preparatory to "retting." The crop is pulled before the seed is ripe; consequently the crop cannot have a dual purpose, the producer deciding upon either seed or fibre. Retting, or literally rotting, consists of submerging the sheaves of flax in ponds or slowly flowing streams for 8-12 days, during which a process of fermentation is set up that separates the outside and inside layers of tissues of the stem from the phloem or fibrous portion. After retting the sheaves are opened and the flax is spread out to dry; after drying, it is subjected to scutching, a mechanical means of separating fibre from other portions of the stem. After the removal of all adhering portions of the stem, fibre is transferred to the spinner and then to the weaver, by whom it is converted into the desired textile.

Linen has been used by man since the dawn of history. In



Flaxman. Mercury and Pandora, an example of John Flaxman's work

England in Tudor times, and later, the cultivation of flax was made compulsory. Although flax is still grown to a limited extent in England, British cultivation on a substantial scale is now confined to N. Ireland. During the Second Great War the main sources of supply, notably Belgium, were

cut off, and efforts were again made in England to grow flax for fibre. The yield of scutched flax per acre varies seasonally; the highest recorded in N. Ireland was 48 stones in 1847, and the lowest 12.7 stones in 1871; on an average it is between 25 and 30 stones. Linseed, i.e. seed of the flax plant, is produced for commercial purposes in India and Argentina. Seed rather than fibre being the objective, plants with short straw and strongly developed branching habit and large seed are cultivated. Approximately one-third of the weight of linseed is oil, and the residue of the seed after oil has been abstracted forms a valuable livestock concentrate. All forms of flax require well tilled land, free of weeds, and an ample supply of potash; the fibre crop also succeeds best in localities with ample rainfall and a general high humidity.

**Flaxman, JOHN** (1755-1826). English sculptor. Born at York, July 6, 1755, he was the son of a maker of plaster casts. Owing to physical deformity, his childhood in London was passed mainly in his father's shop, where he drew, modelled, and studied the classics. In 1770 he entered the Academy schools, having previously exhibited and gained awards at the Society of Arts, the Free Society of Artists, etc.; and in 1775 began to be regularly employed by the Wedgwoods in designing classical friezes and medallions for their ware. Married in 1782, Flaxman and his wife went to Rome in 1787. Returning in 1794, they settled in London. In 1797 he was elected A.R.A., and R.A. in 1800, and in 1810 was appointed professor of sculpture. He died Dec. 7, 1826.

Flaxman's most notable monumental works are in Westminster Abbey and St. Paul's, his classical figures and groups at Petworth, Woburn, and other country seats, and his characteristic memorial reliefs are numerous in the British

cathedrals and churches. Collections of his drawings are in the British and South Kensington museums, and the Fitzwilliam museum, Cambridge. University college, in Gower Street, London, housed in the Flaxman gallery original drawings and sketches in pen and pencil, and also plaster casts from his clay models. This collection was badly damaged in German air raids in 1940. See Sculpture.

**Flea** (order Aphaniptera or Siphonaptera). Group of about 1,000



Flea. Much enlarged specimens. 1. Rat flea. 2. Common flea, *Pulex irritans*, male and, 3, female

1 Photographed at Nat Hist Museum, S Kensington

species of small wingless insects, living when adult as parasites on birds or mammals. The body is laterally compressed, with a tough, shiny integument. The hind legs are very large and used for leaping. The vertical leap of the common flea is stated to be 7½ ins. Usually each species lives on a particular host, but many can live, at least temporarily, on a different host. The mouth-parts are piercing organs used for sucking blood—the staple food of fleas. The rat flea migrates readily to man, and is a carrier of the bacillus of bubonic plague. Eggs of fleas are normally laid in the haunts or sleeping places of the hosts. The larvae are worm-like and feed on debris, those of the common flea taking in organic particles among the dirt of floors.

**Fleabane** (*Pulicaria* and *Eriogon*). Group of herbs of the family Compositae. *P. dysenterica*, a native of Europe, N. Africa, and



Fleabane. Leaves and flowers of *Pulicaria dysenterica*

the Himalayas, is a perennial, with creeping rootstock, erect stems, and heart-shaped, oblong, woolly leaves. The daisy-like flower-heads are bright yellow. It was formerly used as a medicine in dysentery. Canadian fleabane (*Erigeron canadensis*), generally distributed in warm and temperate regions, is an annual, with stem 1 or 2 ft. high and narrow, lance-shaped leaves. The small, yellow-centred, white flower-heads are clustered.

**Flèche, LA.** Town of France. It stands on the Loir, 24 m. S.W. of Le Mans, in the dept. of Sarthe. It is an agricultural centre, trading in corn, wine, etc., and has also some small manufactures; its buildings include a town hall, museum, and theatre. More famous is the military school here known as the Prytanée, from which students pass to St. Cyr. Founded in 1774, this occupies the buildings of a Jesuit College, and has a large library. The earlier college, at which Descartes was educated, was founded in 1604 by Henry IV, to whom there is a statue in the market place. La Flèche was liberated in the rapid U.S. advance at the beginning of Aug., 1944. Pop. 11,293.

**Flecker, JAMES ELROY** (1884-1915). British poet. Son of a clergyman and born in London, Nov. 5, 1884, he was christened Herman, which name he changed to James later. He was educated at Dean Close, Cheltenham, Up-pingham, and Trinity college, Oxford. He joined the consular service in 1910, the year in which his Twenty-Six Poems appeared, and served in Constantinople (Istanbul) and Smyrna (Izmir); but tuberculosis forced him to abandon his profession, and he died at Davos, Jan. 3, 1915.

Flecker early showed signs of becoming one of the most notable poets of his generation, and lived to see his work recognized by the critics. He possessed a fine, lyric quality, and took a sensuous delight in words of colour. Such poems as *The Old Ships*, *The Dying Patriot*, and *To a Poet a Thousand Years Hence*, found a permanent place in anthologies; others include *The Golden Journey to Samarkand*, and *Oak and Olive*. The oriental drama *Hassan* (*q.v.*) is considered his masterpiece. Flecker's poems were collected by J. C. Squire in 1916 (new ed. 1946), and biographical volumes were published by D. Goldring, 1922, and G. Hodgson, 1925. *Consult* Some Letters from Abroad of J. E. F., 1930.

**Fleece.** Coat of the live sheep removed by shearing and forming a fairly coherent mass by the interlocking of adjacent fibres. Fleeces deprived of some of their inferior portions are rolled into bundles, secured by a twist of their own fibre, and packed into bales or into bags known by the trade name of sheets. Locks and pieces are portions of the coat separated by accident or design from the main bulk or fleece. In the course of wool-sorting the fleece is opened out and examined. Fleeces of like quality placed together are described as cased.

Wool of different strengths grows upon different parts of the body, and in sorting wool fully the fleeces are broken up. When the respective sorts of wool from many fleeces have been collected together the lots are given the name of matchings. The term fleece wool in some parts of the country implies wool not of the first clip. Certain manufactured goods, *e.g.* warm linings, are called fleece from their warmth and fleecy appearance. *See* Wool.

**Fleet** (A.S. *flēotan*, to float; *cf.* Ger. *fließen*). Naval term signifying a number of ships under the supreme command of a single officer. In the Royal Navy a battle fleet consists of five or more capital ships with attendant cruisers and destroyers and supply vessels. At one time fleet was synonymous with squadron, but nowadays the fleet is a much larger unit. A group of vessels operating in a specified area is generally given the title of fleet; thus in the Second Great War there was the Pacific Fleet. In peace-time the Royal Navy is divided into the Home, Atlantic, and Mediterranean fleets. In the U.S. navy the word has largely been replaced by the term task force. The whole navy of a nation is often called the fleet, *e.g.* the British fleet. *See* Fishing Fleet; Grand Fleet; Navy; Squadron.

**Fleet.** Urban district of Hampshire, England. It is 6 m. N.E. of Odiham and 36 m. S.W. of London, with a rly. station. A feature is Fleet Pond, a sheet of water 130 acres in extent. Pop. 8,100. There is also a village of this name in Lincolnshire, 2 m. S.E. of Holbeach, on the rly. Pop. 1,334.

**Fleet, THE.** Name of the navigable part of an old London river which, rising in Hampstead, entered the city S. of Chick Lane (now Charterhouse Street) and joined the Thames at Blackfriars. First mentioned in a 12th century MS., it was known as the Fleet Ditch, owing to the frequency with

which it became choked with refuse. The N. part was known as the Holebourne, whence Holborn. After the Great Fire of 1666 it was cleansed, deepened, and called the New Canal. Wharves were erected as well as bridges at Holborn, Fleet Lane, Fleet Street, and Bridewell. The part between Holborn and Fleet Street was arched over in 1737, and later the stream was converted into a sewer, its course being covered by Farringdon Street (*q.v.*) and New Bridge Street.

**Fleet Air Arm.** Name of the Royal Air Force component attached to the Royal Navy, 1922-1937. It continued in common use after the formation of the Air branch of the R.N. in 1937.

Flying from ships began in 1911 (*see* Aircraft Carrier). With the amalgamation of the R.N.A.S. and the R.F.C. to form the R.A.F. on April 1, 1918, all aviation came under the Air ministry. This first introduced non-naval personnel into the air component of the R.N. When the R.A.F. was reorganized for peace-time duty in Dec., 1919, R.A.F. units attached to the fleet for naval air duty were administered by a new R.A.F. command called Coastal Area.

The F.A.A. was created in 1922 to give the R.N. a measure of participation in the R.A.F. naval air component. Thereafter, air units allotted to the F.A.A. included a proportion of naval officer pilots, eventually reaching the maximum proportion of 70 p.c. naval to 30 p.c. R.A.F. personnel. Navigator and observer duties were carried out by specially trained naval officers. Naval ratings were trained as wireless-operator/air-gunners. The officer in command of flying and the aircraft engineer officer in each ship were for many years R.A.F. officers. R.A.F. airmen serviced the aircraft and engines and airframes on board ship and ashore; naval ratings provided the aircraft handling parties. Naval pilots (but not the observers) were seconded to the R.A.F. while attached to the F.A.A. and held commissions at equivalent rank in the R.N. and the R.A.F.; but R.A.F. pilots were not seconded to the R.N.

The Admiralty had full operational control over all R.A.F. units allotted to the F.A.A., and full disciplinary control when units were embarked. The Air ministry had administrative and disciplinary control when units were disembarked to shore air stations (which were then ex-

clusively R.A.F.), retained the functions of design and supply of aircraft and equipment (in consultation with the Admiralty), and undertook initial flying training. The first naval officer pilots' course began in 1924. Pilots were normally seconded to the F.A.A. for four years, after which they returned to purely naval duty.

The F.A.A. was organized in squadrons and flights, with squadrons normally posted to aircraft carriers, and flights to fleets or naval squadrons for duty in fighting ships fitted with catapults (battleships, battle cruisers, and cruisers carrying from one to four aircraft). Fighting ship aircraft were usually either seaplanes or amphibians, able to alight in the water alongside to be hoisted inboard after flight. Except for experimental aircraft, carrier-borne aircraft were landplanes fitted with deck arrestor gear.

By March 31, 1931, the strength of the F.A.A. was equal to 13 squadrons (about 156 operational aircraft) to meet the requirements of six aircraft carriers and various fighting ships. In May, 1935, the first-line strength was 175 aircraft. In 1937 the R.A.F. Far East command administered five and the R.A.F. Mediterranean command eight F.A.A. squadrons; total first line strength was 222 aircraft.

#### Control Transferred to Admiralty

On July 30, 1937, Neville Chamberlain (British prime minister) announced that complete control of the F.A.A. was to pass to the Admiralty, and the official title of the F.A.A. was changed to Air branch, R.N.; personnel became entirely naval; but opportunity to transfer to the Air branch was offered to R.A.F. personnel serving with the F.A.A. The Air ministry transferred four R.A.F. shore air bases to the Admiralty for the exclusive training of naval air personnel. In accordance with naval custom these stations were described as H.M. ships and given "ship" names in addition to their geographical names. The Admiralty at once began to train its own technical officers, previously lacking in the navy; but for a time the R.A.F. continued to provide preliminary flying training.

In April, 1938, to build up a trained reserve, the Admiralty opened a short service Air branch for commissioned officers, and on May 24, 1939, duality ended.

**SECOND GREAT WAR.** At the outbreak of war the Royal Navy had in commission eight aircraft carriers. The majority of these

were soon performing front-line service with the fleet in various theatres of war; H.M.S. *Courageous* was sunk by a U-boat in the first month. Flying equipment was scanty, and (by comparison with that of the R.A.F.) of inferior performance. Moreover, the value of naval aircraft was at first undervalued in many influential quarters.

The F.A.A. was first in the public eye when a single Seafox seaplane spotted for the naval guns at the battle of the River Plate, Dec., 1939; but with the growth of naval power and the increasing tempo of the war its work grew steadily more important to the strategists and more spectacular to the outside observer. The worth of the Fairey Swordfish (*q.v.*) torpedo bomber was demonstrated at Narvik in April, 1940. In June the *Glorious* was sunk, but the first of a new generation of fleet carriers, the *Illustrious* and the *Formidable*, were ready. Swordfish from the *Illustrious* achieved the historic attack on the Italian fleet at Taranto (*q.v.*), Nov. 11, 1940, while *Albacores* and Swordfish flown from the *Formidable* contributed to the British naval victory of Matapan (*q.v.*), Mar. 28, 1941.

Another action in which the F.A.A. cooperated notably with other forces was the sinking of the German battleship *Bismarck* (*q.v.*) in April. This was one of the outstanding events in the career of H.M.S. *Ark Royal* (*q.v.*), last carrier launched before the war. A glorious failure was the attempt by a squadron of Swordfish, led by Lt. Cdr. E. Esmonde (awarded a posthumous V.C.) to destroy the *Gneisenau* (*q.v.*) and the *Scharnhorst*, Feb., 1942. The crippling attack on the *Tirpitz* by the then new Fairey Barracuda dive-bombers (April 3, 1944) was more successful.

The escorting of convoys to Malta and Russia, and the introduction on a large scale of merchant aircraft carriers and "pocket" escort carriers (largely U.S.-built) called into being the two-seat Fairey Fulmar, and the single-seat Sea Hurricane, and soon afterwards the Seafire, little slower than the Spitfire.

It was found that carrier-borne aircraft, despite the apparent vulnerability of their "base," were essential

to any large-scale "task force," and design and production of naval aircraft were given a proper priority. The most successful U.S. designs—Grumman Wildcat, Hellcat, the torpedo-carrying Avenger, the Vought Corsair—also appeared in large numbers under the flag of the Royal Navy, and a further Fairey naval aircraft (the Firefly two-seat fighter) reached squadron service.

Personnel, ships, and aircraft of the Fleet Air Arm played a supporting but vital role in the invasion of France, from north and south, in 1944, and continued to operate extensively from shore bases, particularly in minelaying.

The British Pacific Fleet, formed late in 1944 for the final assault on Japan, included several fleet carriers, notably the *Illustrious*, and four of the new light fleet carrier class. The *Indefatigable*, the *Victorious*, and the *Formidable* were all hit by Japanese suicide bombers, but survived the last savage battles, and earned high praise from the U.S. commander-in-chief. The British carrier force destroyed 148 enemy aircraft and sank 108 ships in the 42 days preceding the surrender of Japan.

The total personnel of the R.N. Air branch then numbered over 70,000, and the strength in first-line aircraft had increased from 340 to about 1,500. In 1946 it was announced that the organization would in future be officially termed Naval Aviation. See Royal Naval Air Service; Royal Navy. Consult Fleet Air Arm (H.M.S.O.), 1943; The Fleet Air Arm, J. Moore, 1943.

**Fleet Prison, THE.** Former prison of old London. Its history has been traced back to the 12th century. Named after the Fleet river, it stood on the E. bank of that stream, S. of Fleet Lane, was burnt in the Great Fire, rebuilt, destroyed in the Gordon riots of 1780, rebuilt again in 1781-82,



Fleet Prison. The inner court, with prisoners engaged in a game of rackets

From a drawing by Rowlandson & Pugin, 1807



purchased by the City Corporation in 1844, used as a stone yard, and sold in 1864 to the L.C. & D.R. On part of the site was erected the Memorial Hall. The prison was used for prisoners of the Star Chamber, and later for debtors and bankrupts. The register books are preserved at Somerset House.

The poet Surrey, Bishop Hooper, Thomas Nash, Donne, Falkland, Prynne, James Howell, Wycherley, and Richard Savage were among notable prisoners here; as, among literary creations, were Falstaff, Mr. Pickwick, and Shandon, the shiftless journalist of Thackeray's *Pendennis*. Here, and in the liberties, clergymen imprisoned for debt celebrated clandestine marriages, between 1614 and 1754, when they became illegal. Favoured

29. 1940) and S. Dunstan in the West, the remains of Clifford's Inn and the second Serjeant's Inn, part of the Law Courts, entrances to the Temple (*q.v.*), and, near to the last-named, a restored timber house of 1610, the projecting upper storey of which, called Prince Henry's Room, is described as the council chamber of the duchy of Cornwall in the time of James I.

Chiefly on the N. side of Fleet Street are lanes, courts, and squares, e.g. Chancery Lane, Fetter Lane, Shoe Lane; Bolt Court, Crane Court, Wine Office Court, Johnson's Court, Red Lion Court; Gough Square. To the S. are Old Mitre Court and Salisbury Square. Whitefriars Street reminds the passer-by of the Carmelite monastery which once stood near. The Cheshire Cheese, Cock, Peele's, and Rainbow represent taverns and coffee houses of an earlier day. The site of the old Mitre tavern of Johnson's time is covered by Hoare's Bank, and that of the Devil tavern by Glyn Mills (Child's) Bank.

Known as the street of ink, from its associations with newspaper offices, the street contains the superb modern offices of the Daily Telegraph, the unusual steel and glass building of the Daily Express, the fine modern block housing Reuter's,

and the London offices of most of the provincial, Empire, and foreign journals. The Great Fire of 1666 extended to Clifford's Inn on the N. side and to the Temple on the S. side, and after it the street was virtually rebuilt.

Wynkyn de Worde, the printer, worked at No. 32, near Temple Bar; Richard Tothill had his printing office in Fleet Street, and here Gorboduc, the first English tragedy, was printed and published. Punch offices, formerly at the N.W. corner of St. Bride's Avenue, were moved to Bouverie Street. At No. 32 John Murray the first published Byron's *Childe Harold*, and John Murray the second the early numbers of the *Quarterly Review*. Samuel Richardson had a house

in Salisbury Court. Michael Drayton and Cowley lived in Fleet Street; Samuel Johnson in Bolt Court, Johnson's Court, and Gough Square. Defoe stood in the pillory within Temple Bar in 1703. Izaak Walton lived on the N. side. The legend of Sweeney Todd, the demon barber, originated in a tale published in 1840. London's first pillar-box was put up at Ludgate Circus in 1855. Outside St. Dunstan's is a bust of Lord Northcliffe, and Edgar Wallace is commemorated by a plaque in Ludgate Circus where he once sold newspapers, while a bust of T. P. O'Connor is on the façade of Chronicle House.

**Bibliography.** *Annals of Fleet Street*, E. B. Chancellor, 1912; *Fleet Street in Seven Centuries*, W. G. Bell, 1912; *A Londoner's London*, W. Whitten, 1913; *Street of Ink*, H. Simonis, 1917.

**Fleet Train.** British naval supply and maintenance organization formed early in 1945 to supply and repair units of the British Pacific fleet in operations against the Japanese. The fleet train enabled warships to put in the maximum amount of service at sea without having to return to shore bases for refuelling and repairs, and was, in effect, a floating industrial seaport. Consisting of over 100 ships of 30 specialised types, it could feed, water, fuel, and munition ships of all categories at sea, carry out action repairs to all types from destroyers to battleships, and transport drafts up to 1,000 men a month.

**Fleetwood.** Mun. borough, seaport, and holiday resort of Lancashire, England. It stands at the

mouth of the Wyre, on Morecambe Bay, 8 m. N. of Blackpool, with a rly. station. It owes its name to Sir P. H. Fleetwood, who built quays and rlys.,



Fleetwood arms

and planned the town in 1836. It has regular steamer service with the Isle of Man, and carries on a brisk coasting trade. The third largest fishing port of the British Isles, it also produces salt for export.

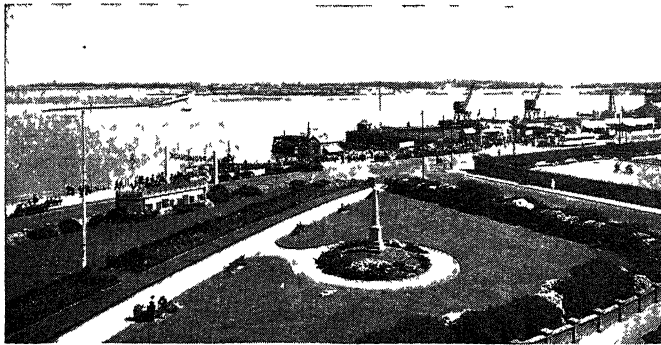
In planning Fleetwood as a holiday resort, every advantage has been taken of the marine views. On the golf course every hole is in sight of the sea, and there are bowling and putting greens on the four-mile promenade. There are a sandy beach, swimming pool, boating lake, and model yacht pond.



Fleet Street. View looking east to S. Paul's. The spire of S. Bride's, which survived German incendiaries, is seen on the right; the projecting clock, left, belongs to the Daily Telegraph building

debtors were allowed to live in what was known as the rules or liberty of the Fleet, which included the N. side of Ludgate Hill and the Old Bailey to Fleet Lane and Market, and along the E. bank of the Fleet to what is now Ludgate Circus. *Consult* The Fleet: River, Prison, and Marriages, J. Ashton, 1888; The Chaplain of the Fleet, W. Besant and J. Rice, 1881.

**Fleet Street.** London thoroughfare in Farringdon Ward Without. Running W. from Ludgate Circus to Temple Bar, its precincts are closely associated with the ecclesiastical, legal, insurance, banking, publishing, and printing activities of the metropolis. It contains two churches of note, S. Bride's (burnt out in the German fire raid of Dec.



Fleetwood, Lancs. Quays and the promenade, which is four miles long and is bordered by bowling and putting greens and other watering-place amenities

The corporation has provided a marine hall, with ballroom, theatre, and restaurant. Pop. 25,000. Rossall School lies 3 m. S.

**Fleetwood, CHARLES** (d. 1692). English soldier. A younger son of Sir Miles Fleetwood, of Northamptonshire, he was trained for the law. He joined the parliamentary army at the outbreak of the Civil War and afterwards commanded



Charles Fleetwood,  
English soldier  
After Walker

a regiment. In 1646 he entered the house of commons as M.P. for Marlborough. He went with Cromwell into Scotland in command of the horse, and was present at Dunbar and Worcester, being at the time of the latter battle in command of the troops in England. Fleetwood was next commander-in-chief in Ireland, 1652-55, being also lord deputy until replaced by Henry Cromwell. Fleetwood was one of Cromwell's ten major-generals, and sat in his house of lords. He was commander-in-chief when Monk entered London, but he hesitated, and was lost; he did not go over to Charles II, while parliament took from him his command. Though he had taken no part in the trial of Charles I, he was exempted from a complete pardon at the Restoration. He died Oct. 4, 1692. In religion a Baptist, Fleetwood was a zealot, without any of the graces of some of the Puritans. He married in 1652 Cromwell's daughter Bridget, but their relations with the Protector were not uniformly cordial.

**Fleg, EDMOND** (b. 1874). French author. Born at Geneva of Jewish parents, he served with distinction in the First Great War. His poem *Le Mur des Fleurs*, 1919, was

translated by Humbert Wolfe as *The Wailing Wall*. It was followed in 1922 by *Écoute Israël*, which presents the history of the Jewish race in epic style, using free rhythms. Other poems include *Le Psaume de la Terre Promise*; *Eternel est Notre Dieu*; *Apocalypse*. Fleg was also an outstanding playwright, wrote a successful novel, *L'Enfant Prophète*, and lives of Moses, Solomon, and Jesus (the last as told by the Wandering Jew). His personal manifesto, *Pourquoi Je Suis Juif* (trans. V. Gollancz, *Why I am a Jew*), was, like all his work, inspired by pride of race.

**Flegel, EDUARD ROBERT** (1855-86). German traveller. Born at Vilna, Oct. 1, 1855, he was appointed to a commercial post at Lagos in 1875, and in 1879 surveyed the Benue river. In 1880 he ascended the Niger to Gomba and in 1882 discovered the source of the Benue. Returning to Europe, he made another expedition, backed by Bismarck, to secure the Benue-Niger district for German trade, but was forestalled by the British Niger Co. He died on the coast at Brass, Sept. 11, 1886.

**Fleischer, DAVE** (b. 1894). American film cartoonist and director. Born in New York, July 14, 1894, he was educated at the Cooper Union, and in 1920 created and directed a series of animated cartoons for the Bray studios. His initial cartoon series, *Out of the Inkwell*, depicting the adventures of Koko the clown, was among the earliest of its kind in the silent film. His later creations included *Betty Boop*, the doll, and *Popeye the sailor*. His full-length films in colour, *Gulliver's Travels* and *Mr. Bug* (or *Hoppity*) *Goes to Town*, though indebted to the work of Disney (*q.v.*), were notable contributions to the art of film cartoon. Fleischer became head cartoonist to Columbia Pictures in 1942.

**Fleming, SIR ALEXANDER** (b. 1881). British pathologist. Born at Darvel, Ayrshire, he was educated at Kilmarnock academy and S. Mary's Hospital. After serving with the R.A.M.C. in the First Great War, he became professor of bacteriology at S. Mary's, discovering lysozyme in



Sir Alexander  
Fleming,  
British pathologist

1922. Fleming realized the possibilities of penicillin (*q.v.*) in 1929, and his research made possible its widespread use in modern medicine and surgery. He became F.R.S. in 1943, received a knighthood in 1944, was awarded the Nobel prize for medicine in 1945, and received the Albert gold medal of the Royal Society of Arts in 1946.

**Fleming, DAVID HAY** (1849-1931). Scottish historian. Born at St. Andrews, May 9, 1849, he was educated at the university there, and published a guide to the city in 1881. He devoted himself to Scottish history from 1888, and among his publications were *Scotland after the Union of the Crowns*, 1890; *Scottish History and Life*, 1902; *Scottish Reformation*, 1903. He died in Nov., 1931, and his work was the subject of a study by H. M. Paton, 1934.

**Fleming, SIR JOHN AMBROSE** (1849-1945). British physicist and engineer. He was born at Lancaster, Nov. 29, 1849, and educated in London at University College and the Royal College of Chemistry. He was a science master at Cheltenham in 1874, and



Sir Ambrose Fleming,  
British physicist  
and engineer

worked at Cambridge under Clerk-Maxwell, 1877-81. Then he went to University College, Nottingham, as professor of physics and mathematics, returning to London in 1885 as professor of electrical engineering at University College, remaining until 1926. He also acted as adviser to the Edison Electric Lighting Co.

Fleming was associated with the introduction into Great Britain of the telephone, electric lighting by incandescent lamps, and wireless telegraphy. He invented the thermionic valve that revolutionised the practice of wireless, and other

branches of electrical engineering are indebted to him for improvements in method and apparatus. He was elected F.R.S. in 1892 and received a knighthood in 1929. Among his books are *Fifty Years of Electricity*, 1921; *Electrons, Electric Waves, and Wireless Telephony*, 1923; *Memories of a Scientific Life*, 1934. He died at Sidmouth, April 18, 1945.

**Fleming, MARJORY** (1803–11). Scottish infant prodigy. Born Jan. 15, 1803, a niece of Mrs. Keith of Ravelston, at whose house Scott frequently saw her, she read history at the age of six and wrote diaries and poems. She died Dec. 19, 1811. Her journals, letters, and



Marjory Fleming  
After a water-colour  
by I. Keith

verses were collected in 1934; and a biography by O. Malet appeared in 1946. John Brown includes an essay on her in *Horae Subsecivae*.

**Fleming, PETER** (b. 1907). British journalist. Born May 31, 1907, he was educated at Eton and Christ Church, Oxford, and joined the Grenadier Guards. Some racy and unconventional travel books, e.g. *Brazilian Adventure*, 1933; *News from Tartary*, 1936, brought him a public, and he became an assistant editor and leader-writer on *The Times*. He was later a war correspondent in Norway, 1940, and Greece, 1941. He married the actress Celia Johnson in 1935.

**Fleming, SIR SANDFORD** (1827–1915). Canadian engineer. Born at Kirkcaldy, Fife, Jan. 7, 1827, he went to Canada and became connected with rly. construction about 1846. After 1871 he surveyed and constructed the Inter-colonial line, and afterwards he surveyed a route through the Rockies for the C.P.R. He advocated an imperial cable system and standard time. Made a K.C.M.G. in 1897, he died July 22, 1915.

**Flemings.** Name given to the inhabitants of Flanders. A small sect of early Protestants, influenced by the Mennonites, were called Flemings or Flandrians about the middle of the 16th century. Now numbering 4,500,000 and inhabiting the west of the country, Flemings form slightly over half the population of Belgium. In the First Great War most cooperated loyally against the Germans, but behind the German front a group of Flemish

nationalists supported the occupying power. Pardoned by the Belgian government after the armistice, they continued to demand autonomy and achieved a number of concessions. Radical Flemish nationalists envisaged the union of Flanders with the Netherlands and spoke of Dutch and Flemish forming one nation called *Dietsch*. Germany claimed the Flemings as members of the Germanic family, and with the rise of Hitler, Nazi propaganda was considerable in the region. Flemish influence was responsible for Belgium's detachment from France and return to the policy of neutrality before the Second Great War. The fifth column which assisted Germany in the invasion of Belgium in 1940 was largely composed of Flemings.

Flemish immigrants to England have frequently played a part in English and Welsh history. Chroniclers speak of Tostig having Flemish auxiliaries under his flag at Stamford Bridge, 1066. Henry I settled a number of Flemings in Dyfed, S. Wales, about 1108; they were long the objects of Welsh hostility. In the battle with the S. Wales marchers at Teifi Ford, near Cardigan, in 1136, numbers of these settlers were slain. Other attacks on them in 1144 and 1164 were avenged by their harrying of Iscold or Lower Gwent in 1165. Strongly attacked by the Welsh

leader Maelgwyn Gwynedd, 1188, they made submission to Llewellyn I in 1217. Flemings influenced the growth of the woollen and weaving industries in England, especially in E. Anglia. *See Flanders.*

**Flemington.** Suburb of Melbourne, Victoria. It is 3 m. N. of the city and has a fine racecourse, founded 1861, on which is run the race for the Melbourne Cup.

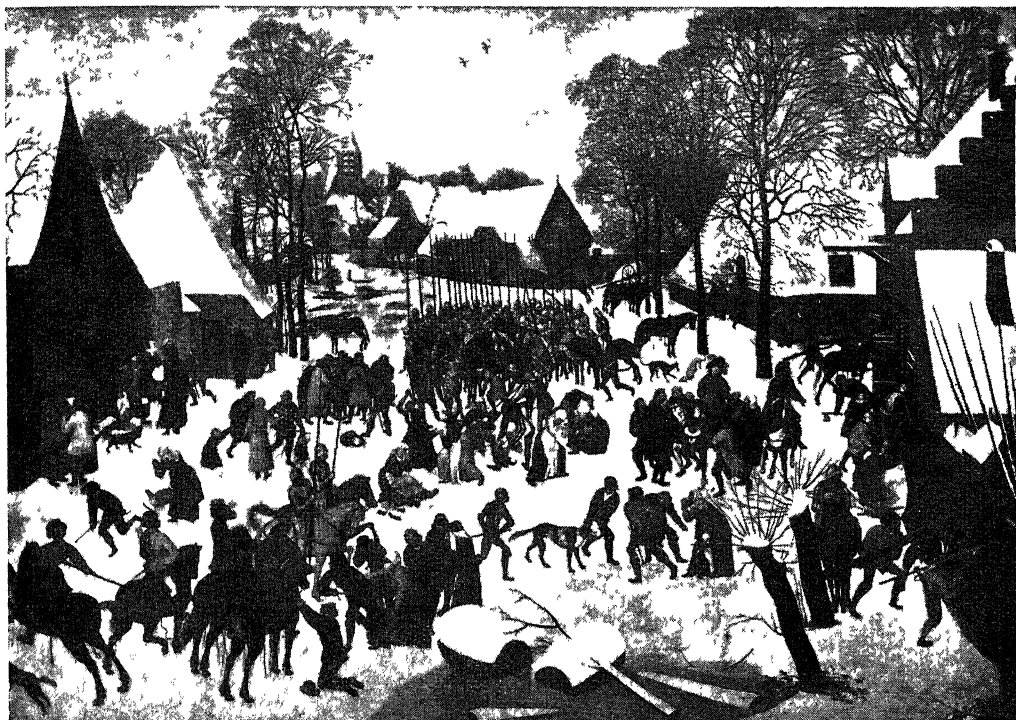
#### **Flemish School of PAINTING.**

Distinctive type of art which emerged in Flanders in the 15th century, particularly at Bruges, Ghent, and Antwerp. The earliest phases at the first two are still obscure. The first names to emerge are those of the Limburg brothers, illuminators, of Maaseyck. Next come the brothers van Eyck, Hubert (c. 1366–1426) and Jan (c. 1385–1440), usually considered the founders of the school and certainly its main inspiration. Their Ghent altar-piece, *The Adoration of the Lamb* (*see illus.* page 3227) begun by Hubert in 1420, completed by Jan in 1432, helped to establish the predominance of the Flemish style of painting in N. Europe. If they did not invent oil-painting, they were the first to reveal its full possibilities and so to improve its technique as to make it virtually a new medium; and this is one of the great contributions of the Flemish school to the history of art, though the secret of the van Eycks' own perfection of the medium appears to have died with them.

Notable names among the following generation of painters are the so-called *Maitre de Flammelle* (possibly Robert Campin), Jacques Duret, Roger van der Weyden, Dierick Bouts, and Petrus Christus. A little later were Hans Memlinc, Hugo van der Goes, Gérard David, and Quinten Matsys. These were all religious painters. Their contemporaries included Jerome Bosch, the earliest satirist, and Patinir, one of the first landscape painters.



Flemish School. Madonna and Child Enthroned,  
by Dierick Bouts (c. 1410–75)  
National Gallery, London



Flemish School. Massacre of the Innocents, by Pieter Bruegel the Younger, typical of detailed composition of the 16th century Flemish painters. This picture, in the museum at Brussels, is an exact copy of one by P. Bruegel the elder in Vienna

In the work of these Flemish primitives the true Gothic spirit found expression. They record the intensity of the Gothic conception of the Christian drama, and reflect the desire for richness and elaboration of detail inseparable from the Gothic ideal. No Italian master rivalled them in this respect; nor, when Flemish technique was practised in Italy, could any southern painters attain their brilliance and delicacy. The Flemish technique, derived from missal illumination, was unsuited to the large demands of wall decoration which engrossed the Italian painters. But the influence of the Flemish masters of the 15th century on the art of Germany, Spain, and Portugal was important, and in England, especially in East Anglia, Flemish painters had considerable business.

A new phase entered with Jan Mabuse (1472-1532), who studied in Italy and introduced an alien note into the native vision. The rococo period of excessive elaboration with no compensation in the way of serious interpretation is represented by van Orley, Mostaert, and Engelbrechtsen; and rather more happily by Lucas van Leyden and Scovel. In this period the satirical genre picture, indi-

genous to the Low Countries and later developed by the Dutch painters, was first introduced, well-known examples being the Money-lenders and Misers of M. van Reyerswael. The greatest genre painter of the school, the last and

the most original of all the Primitive masters, was Pieter Bruegel (1526-1569), the only one to achieve a mural largeness of style, yet retain animation and humour.

Flemish painting reached its full flowering in the 16th and early

17th centuries with the emergence of its outstanding exuberant and prolific genius, Rubens (1577-1640) and his pupils and disciples, chief of whom was van Dyck. The notable masters of this final period include Cornelius de Vos, portrait painter; Paulus de Vos and Snyders, animal painters; Jakob Jordaens, best described as a lesser Rubens; and David Teniers, who might with equal justice be called a minor Bruegel, and whose lively work forms a



Flemish School. A Canon with Patron Saints, by Gerard David (c. 1450-1523), a pupil of Hans Memling  
National Gallery, London

link between the Flemish and Dutch genre painters.

It should be noted that until the clear emergence of a distinctive Dutch school at the end of the 16th century, Flemish art and Dutch art were running on parallel lines and no precise labelling of individual painters as Flemish or Dutch is practicable. This occasionally causes confusion, and use of the broader term "Netherlands school" does not help. It is perhaps simplest, as it is also broadly correct, to describe the 15th and 16th century genius as Flemish and that of the 17th century as Dutch. After the 15th century there was no Flemish school as such.

**Bibliography.** The Flemish School of Painting, A. J. Wauters, Eng. trans. H. Rossell, 1885; Anciens Arts de Flandre, E. Durrand-Gréville, 1905; La Peinture en Belgique, H. Fierens-Gevaert, 1909; Art in Flanders, M. Rooses, 1914; Flemish Painting, E. Cammaerts, 1945.

**Flensburg.** Seaport of Slesvig, Germany. It lies at the S. extremity of the Flensburg Fjord, about 23 m. N. of Slesvig town. Beautifully situated on the steep shores of the land-locked fjord, it has a good harbour, with shipyards, foundries, breweries, and bicycle works as its industries. Whaling vessels in peace-time left annually for the Greenland fisheries. Originally founded during the 12th century, Flensburg has several fine old buildings, notably the churches of S. Nicholas (14th century) and S. Mary (13th century). Formerly a Danish town, it was entered by German troops Feb. 7, 1864, and annexed with Slesvig. The Slesvig-Holstein plebiscite after the First Great War gave a large majority for German rule. The shipyards and torpedo school were heavily bombed in the Second Great War. Here, after Hitler's death, Admiral Doenitz set up his "government," May 1, 1945; and here Doenitz, his "ministers," and the German high command were arrested, Mar. 23, by the Allies. Pop. 66,580.

• **Flers.** Town of France, in the dept. of Orne. It stands on the Vère, 40 m. S. by W. of Caen. It has a 16th century château, and cotton spinning, bleaching, and dyeing works. It was entered by the British 2nd army Aug. 16, 1944. Pop. 12,336. *Pron.* Flare.

• **Flers, ROBERT DE LA MOTTE-ANGO, MARQUIS OF (1872-1927).** French dramatist. Born at Pont-l'Évêque, Nov. 22, 1872, and educated at Paris, he made his reputation as collaborator with

G. A. de Caillavet in a series of light and witty comedies. Among them are *Les Travaux d'Hercule*, 1901; *Primerose*, 1911; *L'Habit Vert*, 1912; *La Belle Aventure*, 1913. He became editor of *Le Figaro*, with Alfred Capus, in 1914; he resigned this post in 1920, rejoining the paper in 1922. He died July 30, 1927.

**Fleshly School of Poetry, THE.** Derisive name given to certain 19th century poets, chiefly D. G. Rossetti and A. C. Swinburne. It originated in an article in *The Contemporary Review*, entitled *The Fleshly School of Poetry and Other Phenomena of the Day*, by Thomas Maitland (Robert Buchanan), which was afterwards published as a pamphlet, 1872. Swinburne replied in *Under the Microscope*, 1872. Buchanan later made a full *amende honorable* in regard to Rossetti's work.

**Fletcher, ANDREW, OF SALTOUN (1655-1716).** Scottish politician. Born at Saltoun (now Salton), East Lothian, he was educated by the parish minister, Gilbert Burnet, afterwards bishop of Salisbury. He sat as a commissioner in the Scots convention of estates in 1678, and vigorously opposed the government. In 1685 he joined Monmouth's expedition to England, but, having killed a man in a private quarrel, fled to Spain. He returned in 1688 with William of Orange, and became a determined opponent of the Union. He is remembered by the remark from his *Account of a Conversation*, "I knew a very wise man, so much of Sir Christopher's (Sir Christopher Musgrave's) sentiment, that he believed if a man were permitted to make all the ballads, he would not care who should make the laws of a nation." Fletcher set up the first barley mill in the British Isles.



Andrew Fletcher,  
Scottish politician  
After Allan

**Fletcher, SIR BANISTER FLIGHT (b. 1866).** British architect. Born in London, Feb. 15, 1866, he was educated at the Royal Academy schools and London university, at which he was lecturer and assistant professor (King's College) and university staff lecturer on architecture. President of the R.I.B.A., and for many years partner in the firm of architects which bore his name, he was knighted in 1919. His publications include

his great *History of Architecture on the Comparative Method*—a standard work; *Andrea Palladio*; *The Influence of Material on Architecture*; *The English Home*.



Sir Banister Fletcher,  
British architect

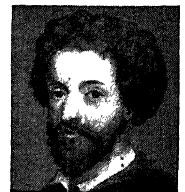
**Fletcher, GILES (c. 1588-1623).** English poet. Brother of Phineas and cousin of John Fletcher, the dramatist, he was educated at Westminster and Cambridge, and died rector of Alderton, Suffolk. His principal work, an allegorical poem entitled *Christ's Victory and Triumph*, 1610, was modelled on Spenser's *Faerie Queene*, and influenced Milton.

**Fletcher, SIR HENRY (1727-1807).** British politician and administrator. Born in Cumberland, he served the E. India Co. from boyhood in capacities ranging from sea-captain to director, 1769-87, and chairman, 1782-83. Whig M.P. for Cumberland, 1786-1806, he received a baronetcy in 1782. He supported Fox's proposals for administrative reforms in India and Grey's measure for parliamentary reform; and was highly regarded for his personal character and liberality. He died March 25, 1807.

**Fletcher, HANS LIP (b. 1874).** British artist. Born in London, he was educated at Merchant Taylors'. He became well known for his line-drawings and etchings of London, which appeared in four volumes entitled *Changing London*. Under this title he contributed from 1923 a weekly series of topographical drawings to the *Sunday Times*. His work was purchased by the Walker Art Gallery, Liverpool, the National Museum of Wales, and London Guildhall library.

**Fletcher, JOHN (1579-1625).** English poet and dramatist. Son of Dr. Richard Fletcher, bishop of London, he was

born at Rye, and educated at Bene't (Corpus Christi) College, Cambridge. On his father's death, being left without means, he took to writing for the stage, collaborating about 1607 with Francis Beaumont and others in plays which



John Fletcher,  
English dramatist  
From an old engraving

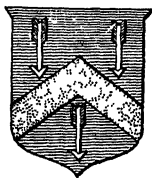
introduced tragi-comedy to the English theatre. Independently he wrote fifteen plays, including *The Faithful Shepherdess* (a beautiful pastoral play), *Valentinian*, *The Wild-Goose Chase*, *Monsieur Thomas*, *Woman's Prize* (a sequel to *The Taming of the Shrew*), *A Wife for a Month*, and *The Chances*. He also collaborated with Massinger, Middleton, Rowley, Field, and Daborne.

To what extent Fletcher was responsible for *The Two Noble Kinsmen* and Henry VIII remains a vexed question. He wrote beautiful lyrics and some of the raciest dialogue in English dramatic literature, and the free movement of his blank verse is a clue to his contribution to plays partly written by others. He died of the plague and was buried Aug. 29, 1625, in S. Saviour's, Southwark. See Beaumont, F.; consult also John Fletcher, O. L. Hatcher, 1905.

**Fletcher, SIR LAZARUS** (1854-1921). A British mineralogist. Born at Salford, March 3, 1854, he was educated at Manchester grammar school and Balliol College, Oxford. Appointed a demonstrator in the Clarendon Laboratory, he remained lecturing in Oxford until 1890, when he became keeper of minerals in the natural history department of the British Museum. He was promoted director of the department in 1909, and resigned in 1919. In 1916 Fletcher was knighted, and his many honours included the F.R.S. From 1888 to 1909 he was secretary of the Mineralogical Society. He wrote *Introduction to the Study of Minerals*, 1884; *Introduction to the Study of Rocks*, 1895. He died Jan. 6, 1921.

**Fletcher, PHINEAS** (1582-1650). English poet. Phineas was brother of Giles Fletcher and, like him, an imitator of Spenser. He died rector of Hilgay, Norfolk. His works have been edited by Grosart, 1868, the most important being a poem of 4,800 lines entitled *The Purple Island*, an extraordinary allegory of the human body.

**Fletchers' Company, THE.** City of London livery company. Of ancient origin and associated with the Bowyers, the Fletchers (Fr. *flèche*, an arrow) is a company by prescription, not charter, was granted arms in 1427, and possessed a hall in St. Mary Axe. The old records



Fletchers' Company arms

have been lost, the earliest extant being dated 1775. The offices are at 33, St. Mary-at-Hill, E.C.3.

**Fleur-de-Lis** (Fr., lily-flower). In heraldry, an extremely ancient symbol. Found among Egyptian hieroglyphics and used by the Anglo-Saxon kings, it was probably a conventional representation of some such flower as the lotus, riverside flags or the iris. It consists of a central bulbous



Fleur-de-Lis in heraldry

petal and two side-curving petals, a fillet and a stalk, usually triparted. The fleur-de-lis, an early cognizance of the Carolingian kings, became identified with the royal houses of France, who bore the golden flowers on a blue shield.

At first the shield was strewn with the lis, but occasionally only three appeared, some say in allusion to the Holy Trinity, a fashion which became permanent under Charles VI. The French arms (azure, semée de lis d'or) was quartered with the arms of England by Edward III; Henry IV reduced the number of lis to three, and after the treaty of Amiens and the Union with Ireland in 1801, the French quartering was omitted from the arms of the English royal family. *Pron.* Fler-de-leess.

**Fleurus.** Town of Belgium, in the prov. of Hainault. It stands in a plain, 8 m. N.E. of Charleroi, and is a junction for the rly. to Gembloux, Landen, and Nivelles. There is a steam tramway to Namur. Four important battles have been fought near this small Belgian town. In the first the duke of Brunswick defeated the Spaniards under Cordova, Aug. 29, 1622. Under Marshal Luxembourg the French gained a victory over the allied Spanish, Dutch, and Germans, July 1, 1690. On June 26, 1794, the French under Jourdan inflicted a crushing defeat upon the Austrians and forced them to evacuate Flanders. Napoleon here defeated the Prussians, June 16, 1815, in the battle usually known as the battle of Ligny (*q.v.*).

**Fleury, FLORY, OR FLOWERY.** In heraldry, any charge decorated



Fleury, in heraldry

with fleur-de-lis. Examples are crosses at the ends of the limbs or in the angles, on the tressure, and on sceptres, etc. See Cross illus.

**Fleury, ANDRÉ HERCULE DE** (1653-1743). French statesman. Born at Lodève, Hérault, June 22, 1653, he was educated at Paris, took holy orders, and became chaplain to Louis XIV, who made him bishop of Fréjus in 1698, and tutor to the future king Louis XV. In 1726 he became chief minister of the latter and was appointed cardinal. His administration was upright and strictly economical, but he did nothing to check the early dissipations of the king or the abuses of the farmers-general.



de Fleury  
After Rigaud

His foreign policy was directed chiefly towards ensuring peace, and to this end he worked closely with the English minister Walpole. The French intervention in Polish affairs in 1733 was undertaken against his better judgement, but he failed to prevent France from being involved in the war of the Austrian Succession, 1740, and died discouraged and in ill-favour, Jan. 29, 1743.

**Fleury, CLAUDE** (1640-1723). French church historian. Born Dec. 6, 1640, in Paris and educated there, he practised for nine years as an advocate, and then devoted himself to theology. In 1672 Louis XIV entrusted him with the education of the young princes, and he became nominally the abbot of Loc-Dieu and later prior of Argenteuil. From 1691 he was writing his *Ecclesiastical History* in 20 volumes. He died July 14, 1723.

**Flexner, SIMON** (1863-1946). American pathologist. Born of Jewish parents at Louisville, Ky., March 25, 1863, he was educated at Johns Hopkins university, Baltimore, at which he became assistant to the professor of pathology, 1895. In 1899 he was appointed professor at Pennsylvania university. Joining the Rockefeller Institute, New York,



as director in 1903, he held the position until 1935, when he became director emeritus. Here he carried out studies of bacteria, germs, and serums, made experiments in the pathology of toxalbumin intoxication, produced in 1905 a serum for preventing death from cerebro-spinal meningitis, and discovered the dysentery bacillus. His work was recognized throughout the world, and he was Eastman professor at Oxford, 1937-38. Flexner died in New York, May 2, 1946.

**Flibbertigibbet** or **DICKIE SLUDGE**. In Scott's novel *Kenilworth* (*q.v.*), a mischievous but

ambitious dwarf, in league with Wayland Smith in deceiving the Berkshire villagers.

**Fliegende Blätter** (Ger. flying leaves). Oldest German humorous weekly paper, founded in 1844. It had little political satire from 1856, but excellent cartoons and stereotyped objects of jokes: the mother-in-law, the naughty little boy, the dandy, the arrogant lieutenant of the Guards. In 1928 it was merged with the *Megendorfer Blätter*, a similar family paper printed in colours. Both periodicals were published at Munich. The paper lapsed during the Nazi period.

than the wing area of the aeroplane, and their speeds are very much lower. The loading per square foot of wing surface of birds rarely exceeds more than three or four lb. and is generally considerably less; their speeds are of the order of 25 to 40 m.p.h. Speeds of 100 m.p.h. and over, which are sometimes attained by certain birds such as the swift and homing pigeon, are due to favourable winds. Radar and high-speed photography, used to measure the speed of birds, show clearly that this has frequently been grossly exaggerated in the past.

High speed photographic methods developed at the Massachusetts Institute of Technology and elsewhere indicate that the flexibility of the wings of birds and insects makes it possible for one of these creatures in flight to change its wing-shape considerably for differing conditions of flight, and still to keep full flying control.

The non-flapping flight (*i.e.* the ability to soar, sometimes for hours) of the albatross, vulture, and other birds, was studied for many years before it was understood. It is achieved without losing height by the use of rising currents of air. These are of two kinds, those due to wind and the varying contours of the ground, and those due to the upward movement of hot air.

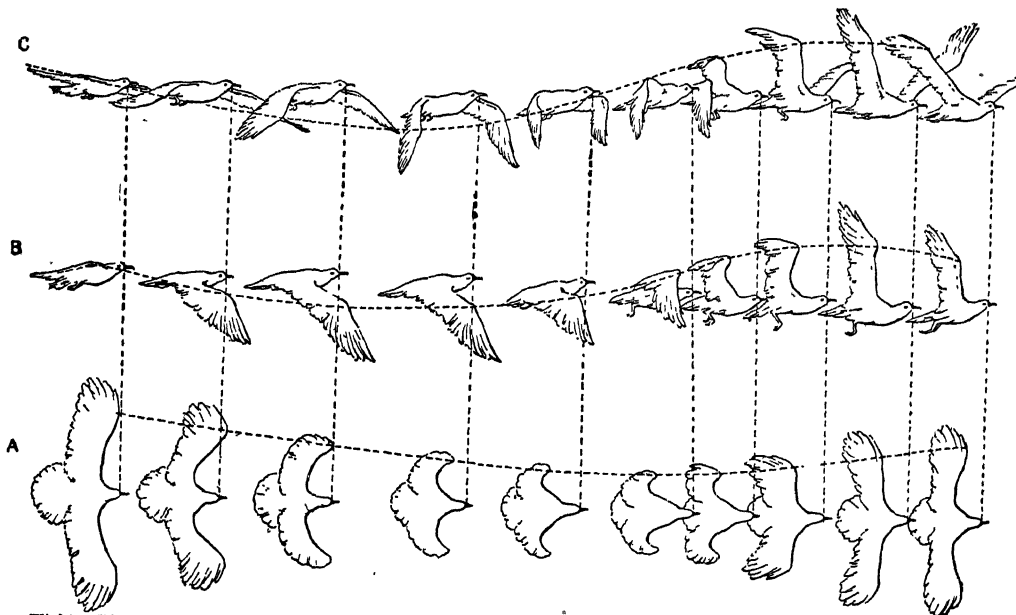
## FLIGHT: BY INSECTS, BIRDS, AND MEN

J. Laurence Pritchard, Hon.F.R.Ae.S., Hon.M.I.Ae.S.

*Man sought to emulate the birds for centuries before he succeeded in leaving the earth's surface in a heavier-than-air machine. Here is a short account first of natural flight, and then of the development of the aeroplane by man. See also Aerodynamics; Aeronautics; Aeroplane; Airship; Glider; Jet Propulsion; Rocket Propulsion, etc.*

The power of flight is possessed by most birds and insects, also bats. They fly (all but bats) by flapping their wings, and as the bird or insect moves forward during flight the motion of the wing is not merely straight up and down, but slightly forward and backward also. The cardinal principle of flight is that the air must be forced downward in order that the bird or the insect can sustain its own weight in flight; or alterna-

tively that the air is forced upwards against the wings of the bird in flight. (The same principle applies to the aeroplane.) The amount of air which is moved in this way in a given time depends largely upon the surface area of the wings, the speed of the bird or insect, and the angle of the wings to the flight path. The areas of the wings of birds and insects, in proportion to their weight, are considerably greater



**Flight.** Diagrams illustrating the flight of a pigeon viewed from three points; A, from above; B, from the side; C, obliquely from side and front

After the diagram by E. J. Marey in "Movement," by permission of Wm. Heinemann

**FLIGHT BY MAN.** The story of man's attempts to fly, prompted by observation of flight in nature, is lost in mythology; but Leonardo da Vinci (*q.v.*) made the first serious study of its possibilities. At the beginning of the 19th century Sir George Cayley pointed out the importance of control and the necessity for

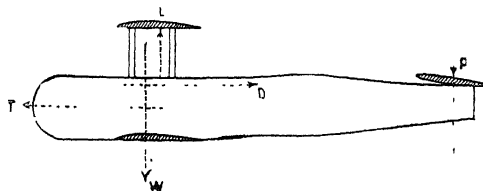
an engine far lighter than any then existing, even predicting the coming of an explosion engine as a possible solution. The power-driven flying models made by Henson and Stringfellow some 50 years later made it clear that it was want of a

suitable motive power that was holding back flying. In the latter half of the century, experiments with gliders showed that these could be made to cover considerable distances, making use (like a soaring bird) of rising currents of air. The German Lilienthal (*q.v.*) constructed an artificial hill outside Berlin from which he carried out experiments, and Pilcher (*q.v.*) in Great Britain constructed a number of gliders in which he flew. Sir Hiram Maxim (*q.v.*) built a huge machine which, driven by a steam engine, lifted several thousand pounds before it was wrecked and abandoned.

By 1898 Professor Langley in the U.S.A. decided that he could build an aeroplane using the internal combustion engine (*q.v.*) as motive power. An American engineer, Manley, produced an engine developing 50 h.p. which weighed only 120 lb. A first attempt at flight in Langley's aeroplane was made in Oct., 1903, a second in December. Both failed. Later knowledge has made it clear that the machine (preserved at the Smithsonian Institution) could not have flown. On Dec. 17, 1903, however, Orville Wright (*q.v.*) made the first powered flight under full control in a machine constructed by him and his brother Wilbur, before building which they had carried out experiments in a primitive wind tunnel, and many gliding experiments in steady winds.

The Wright brothers, like others before them, realized the importance of knowing how much a given surface would lift at a given speed, and how much would be the

resistance of the air to the surface at that speed. Many attempts to glide and fly had failed because they were based on inaccurate figures. The Wrights tested all kinds of planes, and they found that a plane which is curved, as are the wings of birds, gives a considerably greater lifting power, in proportion to its resistance,



**Flight.** Diagram of the forces acting on an aeroplane in horizontal flight. T, the thrust of the propeller; L, the lift on the wings; W, the weight of the aeroplane; D, the resistance or drag; and P, the force on the tail plane to maintain equilibrium

than does a flat plane. The fitting of wings to a structure, however, even if they give sufficient lift, does not ensure safe gliding or flying. For complete safety in the air, it would be necessary to control the motion of the machine used in three directions, a problem yet to be fully solved at very high or very low speeds. Lilienthal, Pilcher, and many other early experimenters were killed when they lost control of their gliders. The Wright brothers fully realized the dangers ahead of them, and provided controls to the best of their knowledge at the time.

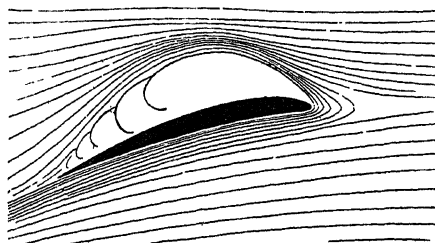
In the normal type of aeroplane there are four controlling units, the engine, the elevators, the rudder, and the ailerons. The elevators are movable parts on the tail surface which can be moved up and down and so alter the angle at which the aeroplane is flying, and therefore its speed. The rudder applies the force necessary to make an aeroplane turn. Unless the aeroplane is correctly banked on the turn it will side-slip, and the function of the ailerons, which are movable parts of the wings, is to obtain the correct banking angle and prevent side-slipping. Aeroplanes have been built and successfully flown without tails or rudders, but they have had alternative mechanisms. Their wings are swept back, and

they have the necessary movable control surfaces on the wing tips.

The theory of the control of an aeroplane under varying conditions of flight is comparatively simple, but the difficulty of putting theory into practice has increased in complexity as speed has increased, increasing the compression of the air on the leading edge of the wing. The flow of air over the wings and body of an aeroplane varies with the speed of the aeroplane and also with the angle at which the wings or the body are meeting the air. No one has yet succeeded in predicting by theoretical methods the form of air flow, although close approximations have been made.

One of the difficulties of the control of aeroplanes at low speed is to keep the air flow smooth over the wing. If the smooth flow begins to break up, the lift is decreased and the resistance increased until "stalling point," when the aeroplane may become completely out of control. A valuable invention to delay onset of the stall was the Handley Page slot, which opens automatically on the wing when the wing begins to lose its lifting power and increases the lift at the moment the aeroplane most requires it.

The greater the speed of the aeroplane, the greater the air resistance, and the higher the h.p. required to force the aeroplane through the air. Flying at great heights, where the air is more rarefied, simplifies this particular problem, but introduces others, e.g. the necessity to provide suitable



**Flight.** Diagram showing how the stream of air is deflected by the curved wing, shown in section in black, of an aeroplane. The air is forced downwards at the rear or trailing edge of the wing, and a partial vacuum is created above the wing with increased pressure below it, so making it lift

air-pressure and temperature conditions for passengers and crews.

At high speeds the air breaks away from the wing differently from at low speeds, and a special shape of wing, known as a laminar flow wing, has been designed to delay the change as long as possible. These wings are, however, easily

affected by minute irregularities in their form or by dust on their surface. One of the great difficulties with high-speed flight is that of landing and taking off, for wings suitable for high speed are not suitable for the low speeds at which landing and taking off are safely effected. Nor are they as a rule suitable where high lift is wanted. This and other difficulties are increasing as speeds which will ultimately no doubt exceed that of sound (about 770 m.p.h. at sea level) are approached.

New methods of flight may solve some of the problems presented by aircraft with fixed wings. Machines with movable wings, such as the Cierro Autogiro and the helicopter, depend for their lifting power on wings which revolve somewhat like a horizontal airscrew of two, three, or more blades. These aircraft can land vertically, or nearly so, at very low speeds, rise vertically from a small area, and hover in the air over a given spot. Theory suggests that they will never fly at the high speeds of the fixed wing aeroplane; but the advantage of ability to land at a low speed in a small space is enough to encourage the development of moving wing aircraft to the utmost extent.

During the Second Great War, much work was done on jet and rocket propulsion as methods of moving aircraft. Rocket propulsion has two advantages: very high speeds—up to 3,000 m.p.h. could be attained with it—and it is independent of atmospheric conditions. The rocket, in fact, works better the higher it flies, as air resistance is lessened. Much the same is true of jet propulsion. Safe landing is the chief problem.

**Bibliography.** Bird Flight, G. C. Aymar, 1936; Biology of Flight, by F. L. Fitzpatrick and K. Stiles, 1942; Aircraft Design, C. H. Latimer Needham, 1939; Elementary Aerodynamics, N. A. V. Pierce, 1944.

**Flight Engineer.** Member of a bomber crew in the R.A.F. who is responsible for the correct functioning of the aircraft engines while in flight. A non-commissioned flight engineer is never of a lower rank than sergeant, while a commissioned flight engineer generally holds the rank of pilot officer or flying officer. A flight engineer's brevet, worn on the left breast of the tunic, consists of a half wing with the letter E.

**Flight Lieutenant.** Commissioned officer in the R.A.F. The rank is equivalent to a lieutenant

in the Royal Navy and captain in the army. The rank was originally introduced into the Royal Naval Air Service (*q.v.*), and when adopted by the R.A.F. was at first confined to officers actually engaged in flying duties, but is now held in all branches of the service. Rank is indicated by two spaced rings on the sleeve of the tunic or on the epaulettes of the greatcoat.

**Flight Mechanic.** Tradesman in the R.A.F. who is responsible for the overhauling of aircraft engines or aircraft frames on the ground. Flight mechanics either enlist in the service as fully qualified tradesmen or join as boy apprentices. They are the second highest paid tradesmen in the R.A.F., and classified in Group II.

**Flight Sergeant.** Non-commissioned officer in the R.A.F., ranking above a sergeant and below a warrant officer. He is equivalent in rank to a staff sergeant in the army and petty officer in the Royal Navy. He may be either in the flying branch of the service or engaged on ground duties. Rank is indicated by three stripes surmounted by a crown worn on the sleeve of the tunic.

**Flinck, GOVAERT** (1615–60). Dutch painter. Born at Cleves, Jan. 25, 1615, he was one of Rembrandt's most successful pupils. His earlier work, painted under the influence of the master, is of greater value than his later Italianate style of court painting. Notable works are The Annunciation to the Shepherds, Louvre; The Grey Bearded Man, Vienna; The Expulsion of Hagar, Berlin, painted for the elector of Brandenburg; The Civic Guard Fête, Amsterdam. He died at Amsterdam, Feb. 2, 1660.

**Flinders.** River of Queensland, Australia. It issues from Mt. Courtney in Douglas co., and flows S.W., W., and then N.W. for a total course of over 300 m., to discharge into the Gulf of Carpentaria, 10 m. S.W. of Kimberley. It was named after Matthew Flinders (*v.i.*), the navigator.

**Flinders, MATTHEW** (1774–1814). British sailor. Born March 16, 1774, at Donington, Lincs, the son of a surgeon, in 1790 he went to transplant bread-fruit trees from the South Sea Islands to the W. Indies. Returning in 1793, he was posted to the *Bellerophon*, saw action on the Glorious First of June (1794), and sailed in the *Reliance* to New South Wales, where he began a series of explorations lasting until 1799, circumnavigating Tasmania, which was hitherto supposed to be part of the mainland.

In 1800 Flinders was appointed to the *Investigator*, and again sailed (1801) for Australia, where he charted the Gulf of Carpentaria, and surveyed the coast of New Holland. On his voyage home, unaware that Great Britain and France were at war, he was detained by the French at Mauritius, and imprisoned, 1803. In 1810 he was released and made his way to England, where he wrote an account of his discoveries. He died July 19, 1814. His name survives in a river of Queensland, a mt. range of S. Australia, a bay of W. Australia, and an island N. of Tasmania.

**Flindersia.** Small genus of evergreen trees of the family Rutaceae. Natives of Australasia and the Moluccas, they have hard, close-grained wood of a yellow tint, useful for many purposes. *F. australis* (Crow's Ash), found in Queensland and New South Wales, grows to a height of 60 ft., with smooth, flaking bark, and alternate leaves broken into three to six oblong leaflets. The numerous small white flowers are in dense clusters. The wood is very durable. The trees are named after Matthew Flinders (*v.s.*).

**Flinders Range.** Mt. system of South Australia. It runs N.N.E. for about 200 m. from Spencer Gulf between Lakes Torrens and Frome, attaining 3,900 ft. in St. Mary's Peak. Uranium has been found in Mt. Painter.

**Flin Flon.** Town of Manitoba, Canada. Near the border of Saskatchewan, in lat. 55° N., it is a branch terminus of the C.N.R. and also served by airway. A mine at Flin Flon Lake has a daily output of 6,000 tons of high grade copper sulphide; power comes from Island Falls on the Churchill River, 56 m. to N.W. The opening of this pre-Cambrian area has transformed Manitoba from a purely agricultural to a partly industrial province. Pop. 7,000.

**Flint.** Crystalline mineral composed mainly of silica; a variety of chalcedony. It is compact, almost opaque, usually dark grey or brown, somewhat harder than steel, and breaks with a shell-like fracture, forming sharp-cutting edges. When first unearthed it is brittle, becoming toughened by



Matthew Flinders  
From an engraving

exposure. Chert and hornstone are coarser forms.

In Great Britain and W. Europe flint occurs mainly in the middle and upper Chalk formations, where it forms irregular nodules, tabular masses, and veins. It is also scattered through Tertiary gravels and alluvial soils, sometimes in great quantities, derived from disintegrated chalk rock. The nodules, sometimes several feet across, are often the silicified remains of sponges, or are hollow shells formed by the concretion of gelatinous silica around urchins, sponges, and other marine organisms. When this dense, non-crystalline constituent, the cause of black flint, is removed, white flint results. The veins were deposited in joints and fissures in chalk rock, carbonate of lime being displaced by dissolved silica of organic origin.

The cutting edge produced by flaking enabled palaeolithic man to invent edged tools, before the introduction of metallurgy. Utilising at first water-worn pebbles or cliff-exposed nodules, this industry led to flint-mining. The discovery that sparks are produced when flint is struck with iron pyrites brought about the percussive method of fire-making. In medieval E. Anglia flint was largely used in church-building, walls being made of undressed or split flints, and porches and battlements panelled with squared flints, sometimes in beautiful colour zones. As road metal it is unsatisfactory because of its readiness to pulverise. Some flint is utilised for pottery and optical or flint-glass. A snow-white quartz powder is obtained by heating flints and throwing them into cold water. In France they are crushed between chert blocks and exported to Great Britain and America. In Essex and the home counties S. of the Thames and in Belgium there is normally a large output, much used in pottery. See Chalk; Flint Implements.

**Flint.** Mun. bor., formerly the county town of Flintshire, Wales. It stands on the S. shore of the Dee estuary, 12 m. N.W. of Chester on the railway. It was once an important harbour, but the accumulation of sand in the estuary now keeps the tidal waters away from the town. Hundreds of acres of marshland in the estuary could be

profitably reclaimed. Artificial silk is made here. There are alkali and copper works, and lead and coal mines in the neighbourhood. The castle, built by Edward I, was the scene of the meeting between Richard II and Bolingbroke, described by Shakespeare, and was twice captured by the parliamentarians and dismantled in 1647. It was taken over by the office of works in 1920. Market day, Sat. Pop. est. 13,050.

**Flint.** City of Michigan, U.S.A., the co. seat of Genesee co. It stands on Flint river, 70 m. by rly. N. by W. of Detroit, and is served by rlys. and an airport. Ranking second in the world to Detroit in production of motor cars, Flint contains the plants of several subsidiaries of General Motors. It developed this prominence from an earlier output of buggies, carriages, and carts. Flint trebled its population during 1900-10. Other manufactured goods include iron products, bricks and tiles, cigars, and flour. Pop. 151,543.

**Flint.** River of Georgia, U.S.A. Rising in the N. part of the state, it flows 350 m. generally S.W. to unite with the Chattahoochee in forming the Apalachicola. Navigable for most of its length, it drains an area of 8,000 sq. m. A hydroelectric power dam and plant completed in 1930, 6 m. from Cordele, develops 19,200 h.p.

**Flint, Sir William Russell** (b. 1880). Scottish painter. Born in Edinburgh, April 4, 1880, he was educated at Daniel Stewart's College, and Royal Institution school of art there. He came to London in 1900, and was on the staff of The Illustrated London News, 1903-07. At his best as a water-colourist and etcher, he became widely known through his illustra-

tions to various limited editions, e.g. Chaucer, Homer, Malory, and Kingsley's The Heroes. Elected A.R.A., 1924, and R.A., 1933, he was president of the Royal Society of Painters in Water Colours from 1936. He was knighted in 1947. He is represented by works in the British and Victoria and Albert museums, Fitzwilliam museum, Cambridge, and in the British dominions and the U.S.A. A biography, More Than Shadows, by A. Palmer, appeared in 1943.

**Flint Implements.** Primitive tools and weapons of flint, which



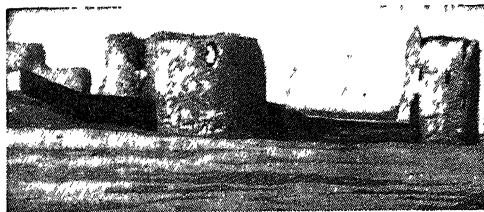
Sir W. Russell Flint, Scottish painter



Four on a Beach, a typical water colour painting by Sir W. Russell Flint, R.A.

from its conchoidal fracture can be worked by flaking or chipping. The term popularly includes quartzite, chalcedony, felsite, chert, hornstone, and other siliceous stones. Perhaps originating in N. Africa, and traceable in a rudimentary form in the dawn of prehistoric Europe, they reached a high level of development during the Stone Age. When flint is broken up by percussion or pressure a conchoidal or shell-like fracture results, with a bulb of percussion where the blow falls. The products are classed as nodules, cores, flakes, chips, and splinters. Long exposure causes a characteristic tinting or patina.

Palaeolithic workshops—with anvil-stones, discarded cores, and spoiled implements—are plentiful, as at Crayford, Kent, and Caddington, Beds. The early Neolithic industry is revealed at Campigny and Grand Pressigny, France; later British factories are Grovehurst, Kent; Skelmuir, Aberdeenshire. Early flint mines have been localised at Spiennes, Belgium, Cissbury Hill, and Grime's Graves. Traces

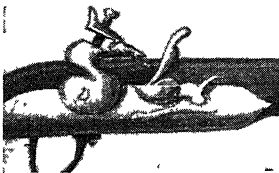


Flint, Wales. Ruins of the castle built by Edward I

of the flint-knapping industry originally for gun-flints and strike-a-lights survive at Brandon, Suffolk. English flints are sometimes 9 ins. long; the finest, sometimes 14 ins. long, come from predynastic Egypt and from Denmark, with exquisite ripple-markings.

Implements of remote date are found in S. and W. Africa, Somaliland, Palestine, India, Burma, and America; their production survives in various parts of the world, e.g. in Australia. Pygmy flints,  $\frac{3}{8}$  in. to  $\frac{1}{2}$  in. long, traceable in the upper Palaeolithic age, became commoner in the Mesolithic Tardenoisian; they range from England (E. Lancashire and Scunthorpe) across Europe to Egypt (Helwan), and thence to India in the Vindhya hills. See Celt; Eolith; Neolith; Palaeolith; Tomahawk; also Anthropology and Aztec illus.

**Flint Lock.** Firing mechanism used on muskets before the introduction of percussion cap cartridges. The flint lock consists of a metal hammer engaged with a trip on the trigger; a flint fixed to the side of the lock; and a small flash pan containing the priming powder. The flint lock is cocked by pulling the hammer to the rear, where it is held by the trigger trip; when the trigger is pressed, the hammer flies forward and strikes the flint, causing a shower of sparks to fall in the flash pan and ignite the priming. The flash pan was usually provided with a cover



Flint Lock. Mechanism of firing device of a 17th century musket

to prevent the priming falling out and getting wet. In some types the cover was automatically raised from the flash pan when the lock was cocked. The flint lock was invented by the Portuguese about 1600, having been developed from the Japanese tinder box. In 1630 it was adopted in France, where it was called *fusil* from *fusile*, a flint. It was introduced into England in the reign of William III, and was the standard British infantry weapon until displaced by the percussion cap in 1840. Early flint locks fired one round every  $2\frac{1}{2}$  min., later types up to 12 rounds.

**Flintshire.** Northern maritime and the smallest co. of Wales. It lies to the W. of the Dee estuary, with a detached portion situated E. of Denbighshire; area, 256 sq. m. A hill range partly crosses the co. parallel to the Dee estuary, which at low tide is a sandy



Flintshire arms

waste. The co. contains the lower courses of the Dee and Clwyd; there are several valleys of considerable beauty, and in these the soil is fertile and under cultivation. Dairy and sheep farming also prosper. Coal, lead, iron, and other minerals are worked. There are iron and steel works along the Dee estuary; artificial silk and flannel are manufactured; and there are cement-making works.

Mold is the county town; Rhyl and Prestatyn are seaside resorts; Flint, Buckley, Connaught Quay, and Holywell are other towns. Flint and Rhudlan have ruined castles, built by Edward I. In 1948 a second M.P. was allotted to the county, which is mostly in the diocese of St. Asaph. Pop. 112,889. Consult History of the Diocese of St. Asaph, D. R.

Thomas, 1908-13; Ancient Monuments in Wales and Monmouth, publ. Royal Commission, 1912.

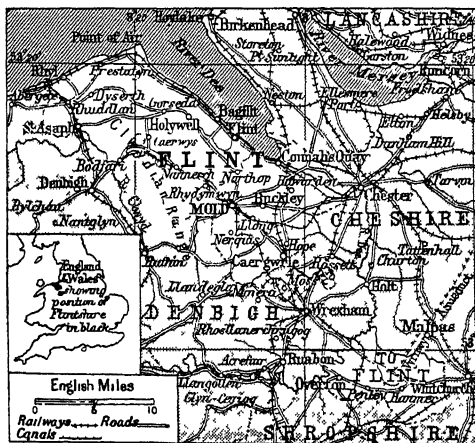
**Flintshire Lead Process.** A reduction process which has been used from remote times in N. Wales. Pure ores obtained from limestone formations are used. The furnace is of the reverberatory type, having the hearth sloping to a central well, from the bottom of which a tap hole drains to a pot outside. A preliminary roasting of the charge on the hearth is followed by a raising of the temperature till the lead begins to run freely, then by a further rise to melt the charge down, the introduction of lime, stirring and mixing, a further roasting, draining, the introduction of a little coal slack to finish, and the tapping out of the metal. See Lead.

**Floating Battery.** The guns mounted on a ship or barge for bombarding shore positions from the sea. In the Second Great War floating batteries of rocket guns carried on special self-propelled barges were used to saturate the beach defences preparatory to the infantry landing in Normandy. See Rocket Weapons.

**Floating Debt.** Term used in national finance. The national debt of the U.K. may be classified into funded debt, not repayable on any definite date, and unfunded debt, repayable on a definite date. Of the unfunded debt, that part issued for a period of less than a year is called the floating debt. It consists of treasury bills, treasury deposit receipts, and ways and means advances. Treasury bills are usually for three months and are offered for tender periodically or sold continuously. T.D.R.s are for six months and now appear as one of the most important assets in the balance sheets of the big banks. Ways and means advances represent the current overdraft of the state. On March 31, 1946, the national debt was roughly £23,637 millions, of which the floating debt was £6,487 millions, made up of treasury bills, £4,423 millions; T.D.R.s, £1,559 millions; ways and means advances, £505 millions. See National Debt.

**Floating Island.** Floating mass of peaty vegetable materials, which collect in the shallower parts of the floor of a lake, and are probably buoyed up by the gases of their decomposition.

**Floating Kidney.** Condition in which the kidney is abnormally mobile and can be moved within the abdomen by manipulation.



Flintshire. Map of this Welsh county showing the detached portion between Cheshire and Shropshire

Lesser degrees of the condition are known as palpable kidney and movable kidney. Common causes of floating kidney are alterations in pressure due to loss of fat; repeated pregnancies; and a general sagging down of the viscera known as *enteroptosis*. Mild cases can be treated by suitable corseting and bandaging of the abdomen. Serious cases need surgical attention.

**Flocculi** (Lat. *floccus*, a lock of wool). Markings bright or dark on photographs of the sun taken in the light emitted by one kind of element, e.g. hydrogen. See Sun.

**Flock** (Lat. *floccus*, a lock of wool). Material used for stuffing beds, cushions, and upholstery, and consisting of either wool waste recovered during the finishing operations of milling, shearing, and raising woollen fabrics, or of the fibres produced by "breaking" worn woollen rags and waste yarn, i.e. tearing them into their constituent fibre by machinery. Flock is obviously liable to contamination with dirt and even infectious material.

Under the Rag Flock Act, 1911, amended 1928, flock from rags of old or new cloth must meet a standard of cleanliness prescribed by the ministry of Health. See Wool.

**Flock Book.** Register of sheep. Special societies, dealing with almost every variety of sheep, publish a flock book in which all pure-bred animals belonging to members are registered and the points of the breed laid down officially. See Sheep.

**Flodden, BATTLE OF.** Fought between the English and the Scots, Sept. 9, 1513. Flodden is a ridge of the Cheviots on the English side of the border. It is 3 m. S.E. of Coldstream, and nearer is the village of Branston. Along it runs the road to Scotland, and near is the Till, flowing to join the Tweed.

Suddenly renewing the war with England, James IV crossed the border on Aug. 22 with a large army and besieged Norham Castle, Surrey, charged with defence of the realm while Henry VIII was fighting in France, collected an army, and marched N., learning on the way that Norham and other castles had fallen to the invader. On Sept. 7 the two forces were only a few miles from each other. Surrey, by a circuitous march, placed his vanguard between the enemy and their line of retreat. The rest of the army moved on an interior line, and on the afternoon of the 9th, were ascending the ridge

whereon the Scots stood—but from the N., not from the S.

Seeing the enemy, James led his men down the ridge to meet them, and the battle was joined at once. Gradually the English gained the upper hand, and the Scots on the wings were soon in flight. On both sides the centre, picked soldiers under James and Surrey respectively, stood to fight it out. It was an unequal duel, for other bodies of English closed round the Scots, who were charged by horsemen from the rear, and when their king was killed they had decisively lost the battle.

The losses of the Scots have been placed at 11,000 out of 40,000 engaged, but both figures are too high. Certain it is that they lost heavily, especially among the nobles, who fought to the last around the king, and it is this that made the day so sad to Scottish memories. The English losses were perhaps 1,000. The best known reference in literature is Scott's description in *Marmion*. A monument, known as the King's stone, marks the spot where James is supposed to have been killed.

**Flogging.** Punishment for crime. In English law, flogging was abolished by the Criminal Justice Act, 1948, except as a prison punishment, and as such it can be awarded only in the case of mutiny, incitement to mutiny, or gross personal violence to a prison officer. Birching, a former punishment for boys under 16, was also abolished by the same Act.

**Flood.** Submersion of land by overflow of water. After extra heavy or prolonged rainfall, or in spring and summer, when snow and ice fields melt, great quantities of surface water drain directly into rivers. At the latter period floodwater is often held up by ice barriers in the lower reaches. The banks cannot contain all the water, which, overflowing, submerges the low-lying parts of the valley. Many parts of the world have clearly marked wet and dry seasons; heavy rains during the wet season cause floods, but the same rivers during the dry season are merely dry courses containing small lakes in the deepest parts of the bed. Floods may be caused by the effects of tide and wind, e.g. in the Thames and Elbe.

Egypt is aptly called "the Gift of the Nile," for in that land occurs the phenomenon of extensive floods in a land of little or no rainfall. The Nile rises in great lakes, situated in a region where rain falls at all seasons, thus

ensuring a steady current of water. But tributaries like the Sobat, Blue Nile, and Atbara have their sources in regions of heavy summer rainfall, and the summer water they bring down causes floods along the lower course of the main stream. But for these waters Egypt would be a desert.

The character of the soil may also aid floods. Large areas of N. England and Scotland are composed of hard or impervious rocks, from which the water is rapidly drained into the rivers, so that the latter are quickly in flood during heavy rains and very low during dry weather. Where limestone or other pervious rocks are found, rain sinks into the ground and the rivers maintain a steady flow, even in dry weather. The Mississippi basin and the great Chinese plains often experience disastrous floods. See Deluge.

**Flood, HENRY (1732-91).** Irish statesman and orator. Educated at Trinity College, Dublin, and



Henry Flood,  
Irish statesman  
After Comerford

Christ Church, Oxford, and called to the English bar in 1750, he entered the Irish house of commons in 1759 as member for Kilkenny. His closely reasoned oratory and his mastery of parliamentary tactics made him leader of the national party, and in 1775 he was made a privy councillor and vice-treasurer of Ireland. His opposition to Henry Grattan (q.v.), who superseded him as party leader about 1781, on the "simple repeal" question led to their famous quarrel, Flood urging the renunciation by England of all claims to influence Irish legislation. He remained loyal, however, to George II. In 1783 Flood was returned to the British house of commons as member for Winchester. He died Dec. 2, 1791.

**Floodlighting.** Effect produced by illuminating the exterior of buildings by powerful concealed electric lamps provided with suitable reflectors. Floodlights were originally used in theatres for special stage effects and later in film studios. For exteriors it was realized that floodlights at night shining upon the vertical faces of buildings of architectural note or historical interest could bring out beauties of design which daylight failed to reveal.





**Floodlighting.** The Royal Naval College at Greenwich, designed by Inigo Jones, John Webb, and Wren, reveals new architectural beauties when floodlit

White floodlighting is the most efficient form of illumination. Coloured floodlighting, using screens in the lamps, is spectacular but is relatively more costly. In some coloured floodlights in the light issues from a gaseous discharge tube, the colour is produced without screens by the characteristic properties of the gas with which the tube is filled. Floodlighting has been used for advertising with success, particularly for illuminating poster sites. The light is turned on and off by a time-switch. Floodlighting is also used in building so that construction can proceed after dark. During the Second Great War portable floodlights were used to facilitate rescue of people buried in bombed buildings. The fire services also provide small floodlights on their engines.

**Floor.** Horizontal division in a building. Floors are described according to position as ground floor, first floor, etc., intermediate levels being known as mezzanine floors. In houses they are usually constructed of timber bridging joists which rest on the walls. When the walls are widely spaced steel or timber beams are used to give intermediate support. Ground floors may be of concrete resting on the ground (solid floors) or of

joists supported on low brick sleeper walls, leaving a space under the floor which must be ventilated. In multi-storey buildings, which must be fire-resisting, concrete reinforced with steel rods is the most suitable material. There are many proprietary forms of floors, some entirely of reinforced concrete (pre-cast or cast *in situ*) and others with hollow tile blocks with reinforced concrete ribs between. Wood floors are finished with boarding, sometimes covered with a thin layer of hardwood laid to a pattern and known as parquet. Concrete floors can be finished with boarding, wood blocks, tiles, marble, etc.

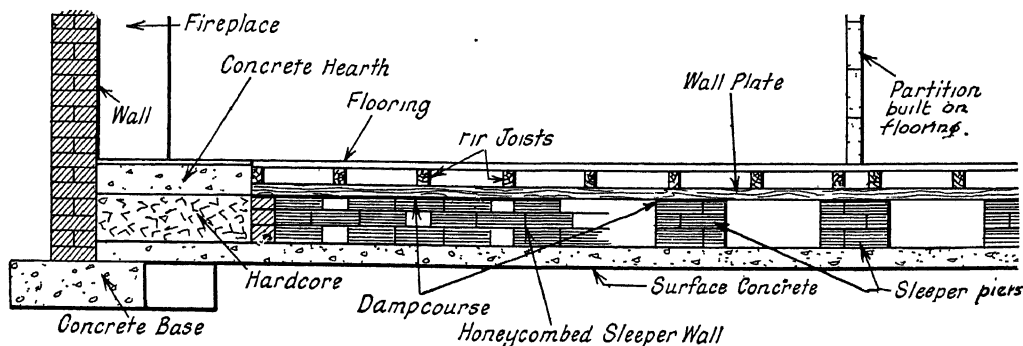
**Floorcloth.** Type of floor covering made by building up successive layers of oil, chalk, and pigment on a woven backing and printing the surface. Such "oilcloth" is not much used nowadays. Kamptulicon (patented by Galloway in 1844) was made of rubber mixed with naphtha, gutta percha, and mineral fillers, but its development was discontinued about 1857 when rubber became too costly owing to vulcanisation. Linoleum (patented by Walton in 1861) is made of oxidised linseed oil, ground cork, gum, pigments, etc., on a woven canvas or other backing. Its simplest form, plain

linoleum, is used as a base for printed linoleums, in which the surface is printed with patterns. Variations of plain linoleums are jaspé, moiré, granite, sheet marble, effects obtained by variations in the mixing and calendering. Inlaid linoleum (first produced 1880) is made by inlaying patterns of plain or multicoloured strips or granules on a canvas backing, the pattern going right through. Cork carpet is similar, except that coarser granules of cork are used and a smaller percentage of oxidised linseed oil, the result being a softer, more resilient surface. Felt base floor covering is made of bituminised paper felt with a printed surface.

**Floors** or **FLEURS** CASTLE. Seat of the duke of Roxburgh. It stands on the Tweed just W. of Kelso. The Kers had long had a residence here when in 1718 Sir John Vanbrugh planned a new house for the duke of Roxburgh. In the middle of the 19th century it was largely rebuilt, being made into a magnificent building in the Tudor style. It has large gardens and commands extensive views. A holly tree is said to stand where James II was killed in 1460.

**Floquet**, CHARLES THOMAS (1828-96). French statesman. Born at St. Jean-Pied-de-Port, Basses Pyrénées, Oct. 2, 1828, he became an advocate and joined the Republican party. He was active in the overthrowing of Napoleon III, and sat as deputy for the Seine in the national assembly of 1871. Suspected of dealings with the communists, he was imprisoned by Thiers' government, but returned to the chamber as one of the deputies for Paris, 1876.

President of the chamber 1885-88, he became president of the council, and formed a radical ministry on April 3, 1888. On



**Floor.** Sectional view of a timber framed ground floor, showing how concrete is used in the construction of the hearth; the sleeper walls and piers and the position of the damp course are also seen



**Flora Day.** The famous Furry Dance being performed in the main street of Helston, Cornwall, on Flora or Furry Day, May 8

July 12 General Boulanger demanded a dissolution, and his accusations of falsehood against Floquet led to their fighting a duel next day, in which both were wounded. The ministry began to lose favour after bringing in a constitutional reform bill, and resigned Feb. 14, 1889. Re-elected president of the chamber, Floquet held this post until it was shown that he had received about £11,500 from the Panama company for the use of his party. This forced his resignation, Nov., 1892, though he made a full statement of defence at the trial of those more culpably involved. He died Jan. 18, 1896.

**Flora.** The collective species of plants growing naturally in any district or country, e.g. the flora of Wales. Also used for a book describing plants, arranged according to the laws of botanical classification.

**Flora.** In Roman mythology, the goddess of flowers. She had a temple near the Circus Maximus, and her festival, Floralia, was held every year from April 28 to May 1.

**Flora Day** or **FURRY DAY.** Holiday observed at Helston, Cornwall, on May 8, the feast of the apparition of S. Michael, patron saint of the town. Its origin was probably pre-Christian and connected with the pagan spring festival. The day was formerly given over to revelry, any person found working being made to leap the river. The Furry Dance is still performed through the streets and in and out of the houses, the dancers headed by a band. Another custom observed is the Halantow; men and boys go into the river valley collecting greenery, and then form a rowdy procession headed by a donkey, blowing mayhorns and singing through the streets a song concerning Robin Hood and Little John. Furry Day attracts crowds of

visitors. The song called The Floral Dance, composed by Katie Moss, refers to this celebration.

## FLORENCE: ITS HISTORY & TREASURES

Cecil Headlam, Author of *Venetia and Northern Italy*

*The city and its buildings are here described, and the history of the state that grew up around it is outlined. See Tuscany; Medici; and biographies of Savonarola, Macchiavelli, and other great Florentines; also Italy: History, Literature, Art; Guelphs and Ghibellines*

Florence, called by the Italians Firenze, lies on both banks of the Arno. The river was spanned,



Florence arms

before the Second Great War, by six bridges, and lined on the N. by modern quays (Lung'arno). Broad boulevards mark the line of the old walls on the right bank.

Across the river (Oltr'arno) the walls and gateways begun by Arnolfo di Cambio, 1285, in succession to the smaller circuit of 1173, and still earlier Roman square, remained almost intact. Set in a valley among the foothills of the Apennines and the Monti di Chianti, Florence owes to the proximity of mountains and sea a variable and trying climate. To this may be ascribed in part the intellectual pre-eminence of her citizens.

The site and development of the city were determined by a natural crossing point in the Arno, where, narrowed by the hill of San Giorgio and deepened by the tributary Mugnone, its navigable course begins soon after it turns W. towards Pisa and the Tyrrhenian Sea. Here, at a point indicated by the recently destroyed Mercato Vecchio, or old forum, later the Piazza Vittorio Emanuele, and the picturesque Ponte Vecchio, designed by Taddeo Gaddi in 1365, the Roman road to the N. probably crossed an older Etruscan road

**Floréal.** Eighth month in the year as rearranged by the authors of the French Revolutionary calendar. It began on April 20 or 21, and the word means the month of flowers.

**Florence.** Province of Tuscany, N. Italy. It lies S. of Bologna, and N. of Siena and Arezzo, midway between the Adriatic and the Ligurian seas. The surface is hilly, and occupies part of the basin of the Arno. The soil is fertile, olives and grapes growing in profusion. Much wine is made, and silk is manufactured. Sheep are reared on the grassy uplands. The capital is Florence; other towns of importance are Prato, Empoli, Fiesole, and Figline. Pop., pre-war, 839,774.

running E. and W. Etruscan walls at Fiesole and Etruscan antiquities in the Museo Archeologico recall the original settlers.

Roman remains include a theatre at Fiesole, and in Florence, baths (Via delle Terme), and an amphitheatre (Piazza Peruzzi). A great temple of Mars is represented in its Christianised form by the baptistery of San Giovanni (Battistero), with its superb gilded doors by Pisano and Ghiberti. The Tuscan-Romanesque churches of S. Apostoli and San Miniato mark the rise of Florence in the 11th century. They inspired the Renaissance churches of Brunelleschi, San Spirito, and San Lorenzo. The latter, near the palace of the Medici, has always been closely connected with that family. Here, besides the domed mausoleum added by Cosimo I, is the new sacristy built by Michelangelo for Pope Clement VII (1524), where that artist's wonderful statues of Day and Night, Evening and Dawn, guard the monuments of Lorenzo and Giuliano de' Medici. Here, too, is the Biblioteca Laurenziana, the priceless library of books and manuscripts collected by Cosimo and Lorenzo il Magnifico, and housed by Michelangelo.

In the 13th century Florence became a veritable forest of towers, built by turbulent nobles, as in the Borgo Santissimi Apostoli. She was now to be adorned with vast Gothic churches and splendid public buildings, such as the palace of the Podestà, the Bargello,

which enshrines the National Museum, and the Palazzo Vecchio, with its soaring tower and projecting battlements, designed (1298) by Arnolfo di Cambio, for the safe housing of the Priori. The adjoining open-vaulted Loggia dei Priori (or Lanzi) was begun in 1376. The captain of the people resided at the Badia, a Benedictine Abbey founded by the mother of Count Hugo of Tuscany, whose graceful campanile dates from 1300.

The first great period of Florentine art coincided with the establishment of democratic government. Niccolò and Giovanni Pisano in sculpture, and in painting, Cimabue, his pupil Giotto, and Andrea Orcagna led the way in the great era of artistic freedom and grace, inspired by that same passionate interest in life as Dante and Boccaccio exhibit in verse and prose. In architecture, Arnolfo di Cambio, besides the city walls and the Palazzo Vecchio, built Santa Croce for the Franciscans (1297). Here, as in the building of the Duomo, he was succeeded by Giotto and Francesco Talenti. In 1420 the great dome of this, the fourth largest church in Europe, was begun by Filippo Brunelleschi. Giotto's lovely campanile, with its four storeys of marble, was begun, 1334, and completed by Andrea Pisano and Francesco Talenti, 1387.

#### Church Architecture

S. of the Piazza del Duomo is the graceful little Loggia del Bigallo (1352), resembling in style Andrea Orcagna's more gorgeous tabernacle in that splendid sanctuary of the guilds, Or San Michele, begun in 1337. The Dominican church of Santa Maria Novella was begun in 1278. The façade is by Leo Battista Alberti, the lovely arcade by Brunelleschi, and the exquisite Spanish chapel by Fra Jacopo Talenti. The much modernised church and convent of San Marco fascinates both by the art of Fra Angelico and Fra Bartolommeo, and its memories of Savonarola. The great 14th century church of the Santissima Annunziata has also been much altered, but contains some of the finest work of Andrea del Sarto.

The story of Florentine art, as it developed through Masolino and Masaccio, Fra Angelico, Lippi, Andrea del Castagno, to Andrea Verrocchio, Sandro Botticelli, Domenico Ghirlandaio and Leonardo da Vinci, Michelangelo Buonarroti and Raphael, and a host of other great artists, including Luca and Andrea della Robbia, Vasari, Benvenuto Cellini, and Gian di Bologna, can be followed in these and other churches, as well as in the great

galleries, the Academy of Fine Art, the Uffizi Palace, government offices constructed by Vasari for the grand duke Cosimo I, and the Pitti Palace. The latter, like the Palazzo Strozzi and Palazzo Rucellai (Alberti), is a typical Renaissance palace, and was begun by Luca Pitti, the opponent of Lorenzo the Magnificent, and afterwards occupied by his successors.

**HISTORY.** Florence was founded by the Etruscans. They had first settled at Fiesole, about 700 B.C., upon a rocky height to the N., commanding the way across the neighbouring Apennines to the Adriatic coast. Tempted down to the banks of the Arno by the commercial advantages of plain and river, they were presently supplanted by the Romans, whose quadrangular castrum is described as *municipium splendidissimum* in the time of Sulla.

Saved from the Goths by the legions of Stilicho and the prayers of Zenobius, a saintly bishop whose miracles often figure in Florentine art, the inhabitants fled later for refuge to Fiesole before the Lombards, but prosperity returned to their city under Charlemagne. The great power of the margraves of Tuscany delayed the rise of the Tuscan towns; but under the protection of Matilda, countess of Tuscany, and after her death in 1115, while Papacy and Empire were fighting for her heritage, Florence developed into a powerful, independent burgher city. Members of the chief families who had administered Florence in Matilda's name, now became consuls of the commune, annually elected, two for each *sestiere*, and were advised by a senate of 100 drawn mainly from the trade guilds. They led the burgher forces in their struggle against imperial vicars and feudal nobles. For the surrounding country, called the *contado*, bristled with castles, whence barons, of Teuton origin and adherents of the Empire, harried the pack-trains of the citizens.

#### Growth of the Commune

As the commune made herself mistress first of Fiesole (1125), and then of the *contado*, she compelled these barons to take up their residence within the city. There they joined with other citizen-nobles of aristocratic tendencies and fortified themselves in lofty towers. Against these societies of the towers, and the domination of an alien power, the burghers of the commune, a commercial democracy of Latin descent, grouped into trade guilds, strove unceasingly. This is the form which the feud betwixt

Guelph and Ghibelline took in Florence.

Her interest as a growing banking and carrying community on the trade-route from Rome naturally inclined Florence to the side of the Church, while involving her in commercial rivalry with Pisa, which barred her free communication with the sea; with Siena, the leading city between her and Rome; Pistoia, and other Ghibelline cities. For centuries she waged deadly trade wars with these rivals until she finally reduced them to subjection. The murder of one of the Buondelmonti, leaders of the democratic party, accentuated the bitterness of party faction.

Beneath the mask of family feuds, the Florentine commune was always striving, through successive changes in the constitution, and in spite of frequent reactions, towards the completest form of democratic liberty known to the Middle Ages. The lower class of artisans and the populace had as yet no share in the government (*Signoria*), except as a parliament (*Arenzo*), assembled in the city square to shout a decision upon momentous matters. But the struggle between people and patrician magnates by this time had already begun.

#### Democratic Developments

The Guelph magnates remained in power, leading the Carroccio and red and white banner (*gonfalone*) of the commune to victory against their neighbours until, in 1249, the Uberti, aided by the Emperor's German troops, thrust them into exile. On the death of Frederick II in 1250, however, the people rose and established the first democratic constitution. Twelve elders (*anziani*) and thirty-six corporals (*caporali*) were appointed as a central government. A popular militia was formed, and a foreign Guelph noble, assisted by a special and a general council, was annually elected as "captain of the people" to champion their cause against the Podestà (1250).

This officer, also an annually elected foreign noble, had replaced the consuls about 1200, and became the representative of the Ghibelline aristocrats and of imperial claims. He, too, presided over two councils; so that there were now two political organizations, that of the nobles and that of the people, within the Republic. Ten years later the exiled Ghibellines, rallying at Siena, and reinforced by the German mercenaries of Manfred of Sicily, defeated the Guelphs at Montaperti.

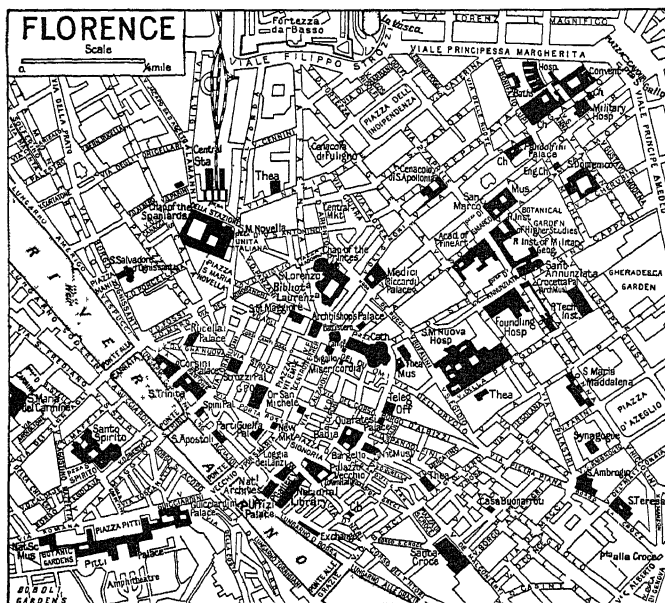
The coming of Charles of Anjou, after the battle of Benevento, put an end to the domination of Ghibelline and German (1266). The



1. Palazzo Vecchio, 1298-1314, used as the town hall since 1871. 2. View from the church of S. Spirito, showing Giotto's campanile and dome of the cathedral. 3. Church of S. Croce, begun in 1294. The new façade built 1857-63. 4. Pitti Palace, begun in 1440, containing the famous picture gallery. 5. The Baptistery, c.1200. 6. Palazzo

Vecchio, the Renaissance courtyard built in the 16th century. 7. Cathedral of S. Maria del Fiore, crowned with Brunelleschi's dome, 1420-34. 8. Portico of the Uffizi Palace, 1560-74, containing Art Galleries and National Library. 9. Ponte Vecchio, across the Arno, built in 1345, and spared by the retreating Germans in 1944.

**FLORENCE: ITALIAN CITY FAMOUS IN LITERATURE AND ART**



Florence. Plan of the centre of the city, showing the principal buildings and bridges; most of the latter were demolished by the German army in 1944

Florentine Guelphs acknowledged Charles's suzerainty as king of Naples and Sicily. An organization (*Parte Guelfa*) was formed to persecute Ghibellines, and a new constitution (*Secondo Popolo*) similar to the first, but of a more democratic character, was set up.

In 1293 the famous ordinances of justice were enacted, intended to restrain the reviving power of the nobles, and barring them altogether from the *Signoria*. In 1300 a new officer of justice, the *Gonfaloniere*, or standard-bearer of the people, was added. Under this republic of merchants (*Villari*) the great "Trecento" era of art and literature blossomed forth.

#### Commercial Prosperity

The commercial prosperity of Florence was now great. Her merchants dealt in the wool of Latium and Lombardy, the oil and wine of Tuscany, the spices, silks, and dyes of the East; the craftsmen of the Calimala guild dressed and dyed foreign cloth into artistic fabrics, which were prized throughout Europe; while her bankers with their standard golden "florin," first coined 1252, provided the necessary medium of exchange, and extended her financial influence far and wide.

Head of the Guelphic League, Florence was now the chief power in Tuscany. At Campaldino (1289) she had shattered the remaining forces of the Tuscan Ghibellines. The Guelphs, however, soon split into factions, Neri

and Bianchi, headed by the Donati and Cerchi families. Dante, an adherent of the Bianchi, was banished when Charles of Valois, in alliance with the Neri, sacked the city, 1301. Nevertheless, the merchant republic succeeded in forming what was practically a confederation of all Italy.

The victorious Neri soon split into factions. Florence then fell a prey to the exactions of the Angevin sovereigns of Naples, and the tyranny of a French soldier of fortune, Walter de Brienne, duke of Athens. After his fall the people rose and annihilated the magnates, 1343.

#### Dawn of the Renaissance

The struggle for political power was henceforth between the rich burgher aristocracy (*Ottimati*) of the greater guilds and *popolo minuto*, the rest of the unfranchised guilds and people, typified by a rising of the latter (*Ciampi*), led by Michele di Lando, a patriotic wool-comber. The dawn of the Renaissance found Florence full of artists and scholars patronised by the Ottimati. Fierce wars were waged with Milan and other cities by mercenaries, such as those led by the English captain Hawkwood, and the dominion of Florence was extended over Pisa (1406), Arezzo, Cortona, and Leghorn. But the divisions of the Republic finally placed it at the mercy of Cosimo, son of Giovanni de' Medici, the richest banker in Italy. Returning from exile, he took his

place as Despot of Florence (1443). The outward forms of the old constitution were retained, while Cosimo controlled the elections and broke the power of the Ottimati. At home he patronised artists (Brunelleschi, Michelozzo, Donatello, Fra Lippo Lippi, Fra Angelico), and encouraged the Neo-Platonism of the Renaissance by his Platonic Academy. He was succeeded by his son Piero (1464) and his grandson Lorenzo il Magnifico.

#### Lorenzo and Savonarola

Lorenzo maintained the balance of power among the five Italian states, and was treated as an equal by foreign potentates. At home, Florence, beautified by artists sprung from the people, became the brilliant world-centre of the revival of Greek culture. But before Lorenzo's death Fra Girolamo Savonarola, denouncing the tyranny and corruption of state and church, had prepared the way for Republican reaction. Roused by Piero II's surrender to the French invaders, the people expelled the three sons of Lorenzo. Charles VIII entered the city, Nov. 17, 1494, and took the Republic under his protection. A brief period of political and spiritual reform, inspired by the prophetic fervour of Savonarola, was followed by the excommunication and burning of the monk (May 23, 1498).

The Gonfaloniere, Piero Soderini (1502), with Niccolò Macchiavelli for secretary of state, maintained the Republic until the Medici were restored by the Spanish invaders (1512). Republicanism made one last glorious effort under Niccolò Capponi (1527). But the emperor Charles V, in alliance with Pope Clement VII, who had ruled Florence as Cardinal Giulio de' Medici, reduced the town after a siege of eleven months.

Charles appointed Alessandro, illegitimate son of Lorenzo, son of Piero II, duke of Florence. Alessandro suppressed the ancient Signoria for ever. He was murdered in the Palazzo Medici by his kinsman, Lorenzino, and was succeeded by Cosimo I de' Medici, "the Great" (1537). Allying himself with Spain and the Papacy, and making himself master of the surrounding country, while he patronised the artists of the late Renaissance, Cosimo founded a long line of grand dukes of Tuscany (1569).

Florence remained the capital of Tuscany when, in 1737, the Medici line having become extinct, the duchy was annexed by the emperor and became an appanage of the House of Austria. After the Napoleonic interludes of the republic and kingdom of

Etruria, 1801-07, Tuscany joined the growing kingdom of Italy by a plebiscite in 1860, and Florence became the first capital of the united kingdom of Italy (1865-71).

Florence was declared an open city on July 1, 1944, during the fighting in the Second Great War, and by Aug. 5 the suburbs on the S. bank of the Arno were in Allied hands. The Germans had destroyed all the bridges except the Ponte Vecchio, and did not evacuate the city until Aug. 11. They shelled it on Aug. 20, causing many casualties among civilians returning from church. British troops entered next day, when fighting between the fascists and Italian patriots had ceased. The Germans had removed works of art from the city galleries, some to villas surrounding the city, where they were found by the advancing allies, others to salt mines in Tirol, where they were discovered after the German surrender. All were accounted for and returned to Florence by July, 1945. The pre-war pop. of the city was 322,535.

Standard histories of Florence are by H. E. Napier, 6 vols., 1846-47; T. A. Trollope, 4 vols., 1865; G. Capponi, 2 vols., 1875 (in Italian); F. T. Perrens, 9 vols., 1877-90 (in French, Eng. trans. H. Lynch, 1892). Consult also A Wanderer in Florence, E. V. Lucas, 1912.

**Florence of Worcester** (d. 1118). English chronicler. A monk at Worcester, he lived in the time of William I and Henry I and died in July, 1118. His chronicle of English history begins with the Creation, and is filled with stories and legends from earlier writings, but is valuable for the period covered by the author's life. The work was continued to 1141 by John of Worcester. An Eng. trans. was edited by B. Thorpe, 1848.

**Flores.** Island of the Azores, in the Atlantic Ocean. It is the most westerly of the group. The surface is mountainous, and sheep are reared on the grassy slopes. The soil is fertile, and fruit and vegetables are cultivated. The chief town is Santa Cruz. Off Flores, in 1591, took place the naval action between Sir Richard Grenville in the *Revenge* and several Spanish vessels, described in Tennyson's poem.

**Flores.** Island of East Indonesia, in the Sunda group of the Malay Archipelago. A dependency of Timor, it lies S. of Celebes, from which it is separated by the Flores Sea, midway be-

tween Java and Timor. Oblong in shape, it is 230 m. from W. to E., with an average breadth from N. to S. of 28 m., and an area of 5,860 sq. m. The chief products include sandalwood, cotton, edible birds'-nests, dyewoods, tortoiseshell, and beeswax, while rubber culture is making progress. Pop. approx. 250,000.

**Flores.** Department of S.W. Uruguay. It is bounded on the N. by Durazno and on the S. by San José. It is hilly, with good pasture; agriculture and stock-raising are the principal industries. The capital is Trinidad, connected by branch line to Durazno on the rly. running N. from Montevideo. Area 1,744 sq. m. Pop. 36,125.

**Flores Sea.** Part of the S. Pacific Ocean. It lies between the island of Flores on the S. and Celebes on the N., E. of the Sunda Sea and W. of the Banda Sea. There are many islands and coral atolls in this sea.

**Floret** (Fr. *fleurlette*, little flower). Term used to denote a small flower, one of a number closely packed together, presenting in the aggregate the appearance of one large flower. This especially applies to the large family Compositae. In the common daisy (*Bellis perennis*) what is popularly called the flower is a closely packed head (*capitulum*) of about 250 florets, of which four-fifths are short, yellow-coloured tubes, constituting the disk. Around the disk is an outer series in which the tube has been split into a much larger white strap. These ray-florets contain no stamens; their principal purpose is to make the flower-head conspicuous and attract insects to effect cross-pollination. Groundsel (*Senecio vulgaris*) has all its florets without rays, while in dandelion (*Taraxacum officinale*) they are all rayed.

**Florey, Sir Howard Walter** (b. 1898). Australian pathologist. Born Sept. 24, 1898, he was educated at Adelaide university, and Magdalen College, Oxford. Professor of pathology at Sheffield, 1931-35, he later carried out experiments and research on penicillin at the Oxford school of pathology. Among his team of collaborators was E. B. Chain (q.v.). Although the initial discovery of penicillin was due to Sir Alexander Fleming (q.v.), Florey's work from 1938 led to the separation of the drug later used in medical treatment from the original penicillin which contained poisonous substances. He was knighted in 1944; in 1945 he

shared the Nobel prize for chemistry with Fleming and Chain; in 1946 he received the Albert gold medal from the Royal Society of Arts. See Penicillin.

**Florian, Jean Pierre Claris de** (1755-94). French author and academician. Born March 6, 1755, he obtained an appointment in the household of the duke of Penhièvre, and afterwards held a commission in a cavalry regiment. He was imprisoned when the Revolution broke out, and died Sept. 13, 1794, soon after his release. Author of several comedies, romances, and pastorals, he was elected to the French Academy in 1788. He is remembered chiefly for his Fables, 1792.

**Florianopolis.** Seaport and city of Brazil; capital of the state of Santa Catharina. Its old name was Desterro. It stands on the W. coast of Santa Catharina Island, 260 m. S.W. of Santos, and is connected to the mainland by a steel bridge 935 yds. long. The fine harbour is guarded by forts. There are a cathedral, government palace, arsenal, hospital, high school, etc. Dairy produce, maize, rice, and tobacco are exported. Pop. 47,150.

**Florida.** State in the extreme S.E. of the U.S.A. Bounded N. by Alabama and Georgia, its area is 58,560 sq. m., including 4,298 sq. m. of inland water, almost exactly the size of England and Wales. It is designated the Peninsular State from its peculiar elongation, or the Everglades State because of 4,472 sq. m. of overgrown marshland in the extreme S. Its tidal coastline, the longest of any state, measures 3,751 m., including the Ten Thousand Islands off the W. coast.

Of limestone formation, Florida has 30,000 lakes, including Okeechobee, 717 sq. m., in the Everglades; many navigable rivers, including the St. John's, Suwannee, and Apalachicola, and innumerable subterranean streams; but no mountains and little elevation. The state passes through three climatic zones, from warm temperate in the N. through semi-tropical to sub-tropical in the extreme S., where a daily average of over 6 hours' sunshine and a mean temp. of 69° F. allows four distinct growing seasons. This portion, which benefits from the Gulf Stream and trade winds, does occasionally suffer from West Indian hurricanes. Frost is unknown at Key West, 100 m. off the mainland. Florida has 3,000 varieties of indigenous flowering



plants, half the tree species found N. of Mexico, and hundreds of species and sub-species of bird, butterfly, and fish.

Famous for oranges and other citrus fruits, Florida also grows pineapples, bananas, avocados, olives, figs, coconuts, peanuts, cotton, tobacco, maize, oats, and sugar cane. It yields 70 p.c. of the nation's phosphate, also fuller's earth, limestone, lime, cement, clay, and forest products. Sponge fishing is profitable. Cattle raising and tung-oil production are comparatively new industries. The pop. increased by 29 p.c. between 1930 and 1940, because of tourists becoming residents, the influx of new industries, and the establishment of military and naval installations, airfields, seaplane and submarine bases. It reached 1,897,414, of whom 514,198 are negroes.

Two senators and six representatives are sent to congress. Tallahassee is the capital. Educational institutions include the university of Florida at Gainesville, a state college for women, state agricultural and mechanical college (for negroes), and the universities of Miami and Tampa, which are privately endowed. St. Augustine, founded in 1565, is the oldest permanent white settlement in the U.S.A. Florida has 7,500 m. of rly., 45,000 m. of paved roads, and a canal system (not yet completed) which, with natural waterways, crosses the Everglades from the Atlantic to the Gulf. The longest overseas thoroughfare in the world, 131 m., over an abandoned rly. and bridges, connects the mainland with Key West, the southernmost city of the U.S.A.

Florida derived its name from the day in 1513 on which it was discovered by Ponce de Léon—Easter Day (Spanish *Pascua Florida* or Feast of Flowers)—and was by turns in the possession of Spain, France, and Great Britain till 1819. The state was admitted to the union in 1845 after having been a territory since 1822. *Consult* The Story of Florida, W. T. Cash, 1938.

**Florida.** Central dept. of Uruguay, bounded N. by Durazno and S. by Canelones. The surface consists of undulating grassy tracts, watered by the Yi river, upon which are reared vast herds of cattle. Area, 4,673 sq. m. Pop. 106,495. The capital is Florida, the centre of a trade in grain, 70 m. by rly. N. of Montevideo.

**Florida Bay.** Arm of the Gulf of Mexico. It separates Florida state, U.S.A., from Florida Keys.

**Florida Keys.** Curved chain of coral and limestone reefs off the S. coast of Florida, U.S.A. Extending S.W. for 175 m. from Miami, they include Key Largo, 30 m. long, and Key West, 4 m. by 2 m. only, but containing the southernmost city of the U.S.A. They are connected by highway with the mainland. Sponge fishing and catering for tourists are the occupations. *See* Key West.

**Florida Straits** or **CHANNEL.** Coastal waters off Florida, U.S.A., alternatively known as the New Bahama Channel. They separate the S.E. extremity of Florida and the Florida Keys from Cuba and the Bahama Islands. The channel is some 300 m. long, has a mean breadth of 80 m., and a greatest depth of 6,000 ft. It is traversed by the Gulf Stream.

**Florideae** or **RHODOPHYCEAE.** Class of Algae or seaweeds. In them the chlorophyll, or green colouring matter, is masked by a red pigment (phyco-erythrin). They have no true roots, but are attached to their supports by suckers, the absorbent function of roots being carried on by the surface cells of the entire plant.

**Florin.** Name of several gold and silver coins of various European currencies. A gold coin struck at Florence in 1252 bore, obverse, the figure of S. John Baptist, reverse, the Florentine lily, whence came the name florin (Ital. *florino*, little flower). Similar pieces appeared in various parts of Italy. Gold florins were also minted by Charles I of Anjou, c. 1335, and by John of Luxembourg, c. 1340. The English gold florin, of approximate value six shillings, issued by Edward III in 1343, was withdrawn in 1344.

The British silver florin, value two shillings, weighed 174.55 grains. It was issued in 1849, intended as

the first step in providing a decimal currency. A bill to bring this about was lost, but the florin continued to be minted. It was at first dubbed the "graceless florin," as the customary D.G. (*Dei Gratia*) did not appear on the issues between 1849–1852. The life of a florin in circulation is estimated at about 45 years.

**Florina.** A town of Greece, in Macedonia, formerly in Turkey-in-Europe. It is about 15 m. S. of Monastir (Bitolj), and was in the tract of territory acquired by Greece as a result of the Balkan wars, 1912–13. It came into prominence during the First Great War. Captured by the French, in April, 1916, it was retaken by the Bulgarians, Aug. 20, and then by Franco-Russian troops, Sept. 18. (*See* Salonica, Expedition to; Serbia, Conquest of.)

The town was overrun by the Germans in the early days of April, 1941 (*see* Greece, Campaign of 1941), and remained in Axis occupation until Nov., 1944. Pop. 10,585. Florina gives its name to a dept. with pop. 152,809.

**Florio, JOHN** (c. 1553–1625). Author and translator. Born in London, he was the son of an

Italian Protestant who became minister to an English congregation of Italians who shared his religious opinions. John was educated at Magdalen College, Oxford, became

a teacher of French and Italian in the university, and held various offices at court, including that of tutor to Prince Henry, son of James I. In 1598 appeared his Italian-English dictionary, *A World of Words*, and in 1603 his famous translation of Montaigne's *Essays*, on which his reputation rests. Florio died of the plague at Fulham. Ben Jonson was one of his friends.

**Florizel.** Character in Shakespeare's *The Winter's Tale*. He is the son of Polixenes, king of Bohemia, and falls in love with Perdita, who, brought up by a Bohemian shepherd, is the lost daughter of Leontes, king of Sicily. The name was applied to the Prince Regent (George IV) on his amour with the actress "Perdita" (Mary) Robinson, whom he first saw playing in *The Winter's Tale*. Prince Florizel is the chief character in Stevenson's *New Arabian Nights*



John Florio, translator of Montaigne



Florin. Gold coin of Edward III; top, florin minted in 1449

Actual diameter of Edward III florin, 1 1/4 ins.; of George VI florin, 1 1/2 ins.

**Florodora.** Musical comedy written by Owen Hall (James Davis) and composed by Leslie Stuart. It was produced Nov. 11, 1899, at the Lyric Theatre, London, where it ran for 455 continuous performances. Its most popular feature was the sextet, Tell me, pretty maiden.

**Floscularia**, OR FLOWER ANIMALCULE. Group of rotifers, common in most ponds. The body is supported on a slender stalk contained in a gelatinous tube, and the wheel-disk is provided with long, bristle-like processes which serve to entangle the minute particles on which the animal feeds. It is just visible to the naked eye.

**Flotation.** Method of mineral dressing, used in concentrating the valuable portion of ores or in removing unwanted constituents. It makes use of the fact that mineral particles may, depending on their type of surface, be made to stick either to water in which they are, suspended or to air bubbles formed in the water. A pulp may be agitated so that a froth is formed, which rises to the surface, carrying certain mineral particles up with it and leaving others in the pulp. Sulphides are particularly amenable to flotation.

The physical and chemical theory behind flotation is complicated. Most, possibly all, minerals can be made to adhere either to water or to air; organic and inorganic chemicals are employed to attain the right conditions. Chemicals which cause particles to stick to air bubbles are known as collectors; organic acids or their alkali salts, such as soaps or xanthates, oleic or palmitic acids, are examples. Typical controllers are alkali hydroxides, carbonates, and silicates, which act as "depressants," keeping certain particles in the pulp, while "activators," such as copper sulphate, alter the surfaces of minerals to help them respond to the collector.

Preparation of the ore by crushing, grinding, preliminary concentration by gravity methods, etc., is needed before an ore may be floated. The machines used differ in design. Usually the pulp is stirred mechanically by a paddle, while air is introduced down the shaft or the air is pumped through the flotation cell in such a way that it causes the necessary agitation. The froth flows over into a launder and forms the concentrate, while the pulp is drained off as tailings. Ores of most base metals and of gold may be

concentrated by the method, while coals may be purified. See Ore Dressing.

**Flotilla** (Span., small fleet). Tactical unit of a fleet consisting of a number of small naval vessels, such as destroyers, submarines, motor torpedo-boats, and minesweepers, grouped under a commodore or a captain and intended to operate as a single unit. The strength of a destroyer flotilla varies according to operational demands, but never exceeds 20 ships, exclusive of the flotilla leader, and is divided into two or more divisions. Although organized in flotillas, submarines usually work independently; during the Second Great War, however, submarine flotillas, often referred to as U-boat packs, were sent by the Germans against Allied shipping in the N. Atlantic. See Navy.

**Flotilla Leader.** A large destroyer accommodating the officer in command of a destroyer flotilla. The average flotilla leader in the Royal Navy displaces 1,870 tons on a length of 350 ft. and a beam of 36 ft. Engines of 44,000 s.h.p. give a speed of 36.5 knots. Armament consists of six 4.7-in. guns mounted in three turrets, 10 A.A. guns ranging in calibre from 4 ins. to 20 mm., and four 21-in. torpedo tubes. A flotilla leader carries a complement of 220.

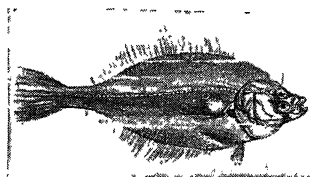
**Flotow, FRIEDRICH, BARON VON** (1812-83). German composer. Of a noble family of Mecklenburg-Schwerin, he was born April 27, 1812, and studied music in Paris. Of his 18 operas the earliest, *Le Naufrage de la Méduse*, brought him a reputation there in 1839. Stradella, 1844, had great success in Germany but failed in England. Martha, first performed at Vienna 1847 and London 1849, is reckoned his finest work. The only other opera to attain popularity was *L'Ombre*, 1870. Flotow was intendant of the Court theatre at Schwerin 1856-63, and in 1864 was elected to the Institut de France. He died at Darmstadt Jan. 24, 1883.

**Flotsam and Jetsam** (low Lat. *flottare*, to float; Lat. *jactare*, to cast). English legal term. Flotsam is goods found floating on the sea, and jetsam means goods jettisoned, cast overboard in a storm, or washed on shore after a wreck. They become crown property unless claimed by the rightful owners.

This name was adopted in 1926 by a pair of music hall and radio entertainers; Flotsam being

Bentley Collingwood Hilliam, who played the piano and wrote all their songs, and Jetsam, Malcolm McEachern (d. 1945), Australian bass singer.

**Flounder** (*Platichthys flesus*). Small species of flatfish, common in the sea and the lower reaches of



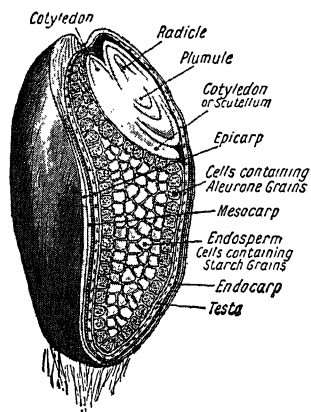
Flounder, a small flatfish found round the coasts of the British Isles

ivers. It belongs to the same group as the plaice, but is smaller, seldom 12 ins. long. It has dark mottlings, and lacks the orange-coloured spots of the larger fish. The flounder produces from one to two million eggs. Its flesh is delicate, but its small size makes it unimportant as a food fish.

**Flour.** The finely ground endosperm of cereal grains, particularly wheat, which may also contain fractions of the protective skins and embryo (germ), according to the method of milling and degree of extraction obtained. When a definite proportion of bran layers is milled into wheaten flour, the product is wheatmeal, whereas wholemeal is ground from whole grain. Rye is also a bread grain, and to a lesser extent barley, oats, rice, and maize; a product from the latter cereal is known as cornflour. Flour is also obtained from farinaceous grasses, fruits, nuts, pulses, roots, and tubers; e.g. bananas, soya beans, potatoes, arrowroot, buckwheat, millet, cassava, manioc, and sago palm pith. Malted flour is milled from malted grain.

The term is also used to denote other finely ground products of commerce; two mineral supplements used in animal feeds are limestone flour and steamed bone flour. A further product is wood flour, obtained from sawdust and used in making plastics and in other industries.

The wheat grain, most important of the cereals used for flour in the W. hemisphere, is a seed, comprising pericarp and seed proper. The pericarp has three skin layers, whilst the seed is further protected by three inner coats, all of which comprise the bran separated in milling. Apart from its coats the seed contains the embryo or germ, situated dorsally at one end



Flour. Longitudinal section of a grain of wheat

of the grain and separated by its scutellar tissue from the endosperm, the main constituent. The first of the inner seeds coatings is the testa or colour-bearing layer, whilst the innermost layer is the aleurone, rich in mineral constituents and nutritive factors.

Grain components vary in proportion according to wheat type, but average figures are pericarp 4 p.c.; testa and hyaline layer 2.5 p.c.; aleurone layer 6-7 p.c.; germ 2.5 p.c.; endosperm 85 p.c. Typical average composition of whole wheat grain and its components is as follows, the four

sets of figures relating to (1) whole grain, (2) endosperm, (3) bran, and (4) germ.

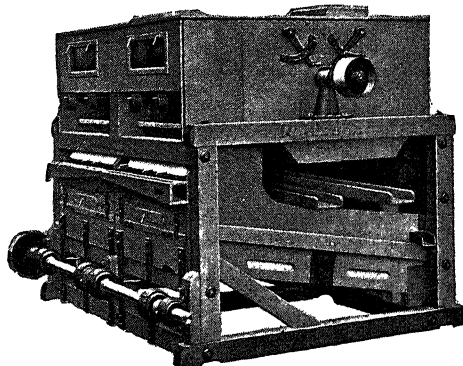
	(1)	(2)	(3)	(4)
Moisture	12.2	13.8	12.5	13.5
Oil	1.8	1.2	4.7	10.8
Protein	13.2	12.0	15.0	25.9
Fibre	2.1	0.2	7.9	1.9
Ash	1.7	0.55	4.65	4.1

The principal proteins are glutenin and gliadin, which together with water form gluten, the elastic substance in the flour which traps the aerating gas generated in the bread dough and thereby forms the cell-like structure and framework of the loaf, holding together the starch and other components.

Dividing white flour into grades according to colour and quality is normal practice. When only one grade is milled it is known as straight run flour. White flour is usually milled at 70-72 p.c. extraction, but flours up to 80 p.c. extraction can be milled which are near-white in colour and possess similar baking characteristics to those of white flour but a higher

proportion of valuable grain nutrients. Flour milled at still higher extractions assumes the character of wheatmeal.

Nutritional items occurring in wheat are iron and calcium, although the availability of the latter decreases with higher extractions on account of the phytic acid present. Also there are the Vitamins B<sub>1</sub>, riboflavin, and nicotinic acid. The scutellum fraction of the germ is the richest source

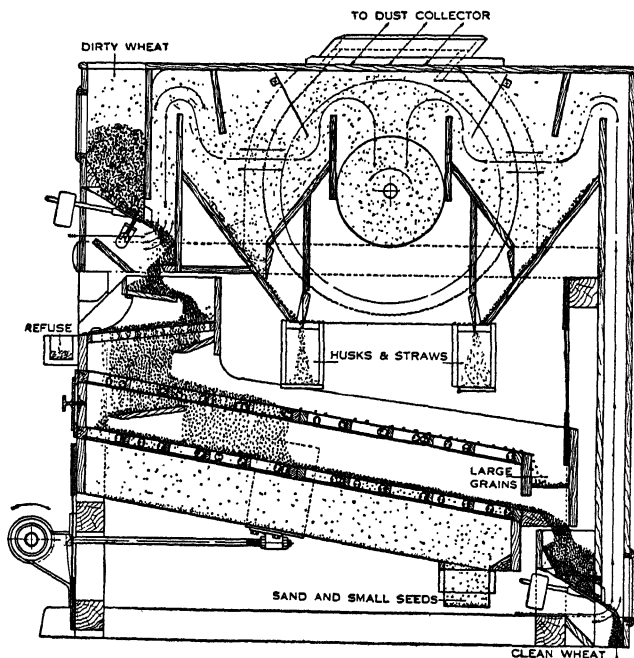


Flour Mill. Separator for removing impurities such as straw, dust, etc., from wheat and other grain before milling  
Courtesy of Thos. Robinson & Son, Ltd., Rochdale

of Vitamin B<sub>1</sub>. Semolina is a flour mill product, used in making macaroni and vermicelli. Industrially, granular flour is used in the preparation of powder alcohol. The average gross imports of wheat and flour into the U.K. for the five years up to 1938-39 were 5,148,855 tons and 409,000 tons respectively. At the end of the Second Great War the average weekly consumption of flour in the country was about 100,000 tons, requiring 112,000 tons of wheat. The wartime loaf included roughly 75 p.c. imported wheat and flour—shipped from Canada.

**Flourens, GUSTAVE** (1838-71). French politician. The son of the physiologist, Marie J. P. Flourens (1794-1867), known as the associate of Cuvier, he was born in Paris, Aug. 4, 1838. He began life as a lecturer and writer, but was soon associating with revolutionaries in Italy and elsewhere. In Feb., 1870, he headed a futile rising against Napoleon III, and after the abdication of the emperor he was one of the leaders of the commune. He was killed during the fighting at Rueil, April 3, 1871.

**Flour Mill.** Building equipped for grinding grain, especially wheat, into flour. The application of steam power to millstone grinding in 1784 led not only to improved



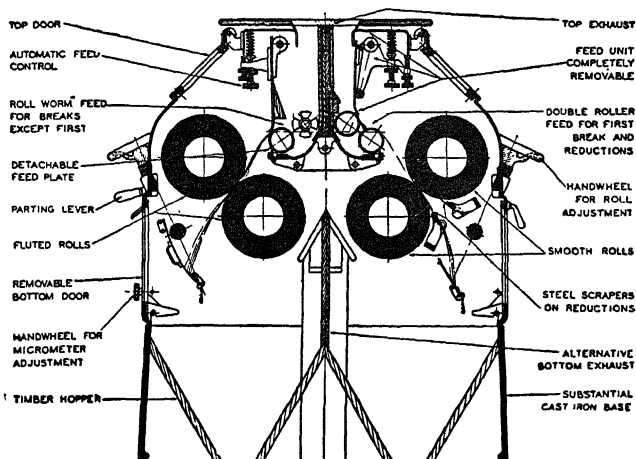
Flour Mill. Longitudinal section of the milling separator shown in the photograph above. The flow of grain and the air currents are indicated

methods of direct reduction, but also to the invention of systems for gradual reduction by means of rolls. Millstones are still used for whole wheatmeal, oatmeal, and other grain and pulses. The stones—French burrs, Derbyshire peaks, or composition disks—are usually 1 ft. thick and 4-4½ ft. in diameter, scored with straight furrows tapering to ¼ in. in depth. The upper stones rotate at a maximum of 150 r.p.m.

Although small hand-turned roller mills were produced casually from the 16th century, it was not until 1837 that Sulzberger, a Swiss engineer, founded the modern iron roller system. Porcelain rolls, introduced in 1870, have now long been discarded. Roller mills were erected in Glasgow in 1872 and in Dublin in 1878. For some years stones and rolls were employed in the same mills. But after 1881, when an exhibition was held in Islington, British millers rapidly adopted the roller system, which today deals with all but a minute fraction of the flour milling of the world.

Roller mills are equipped with silos or granaries, containing storage bins of wood, steel, or ferro-concrete, and are filled from the intake plant consisting of bucket type elevator or pneumatic conveyors that can be lowered into ship holds, and deliver the grain on to horizontal screw or hand conveyors over the bins. Road or rail wagons discharge grain into silo wall hoppers. The grain is drawn from the bins for cleaning, which is effected by milling separators using a system of sieves and air currents. Magnets retain stray iron objects such as nails, and the grain is next subjected to scouring to loosen remaining husks and surface dirt. Cockle and barley cylinders follow; these have indents shaped so as to catch smaller and reject larger seeds respectively. Most grain requires washing; and wheat is next dried or mellowed to bring it into the best physical state for milling.

A roller mill stand contains two pairs of chilled iron rolls set diagonally and rotating at differential speeds. Break rolls are corrugated spirally with saw-tooth



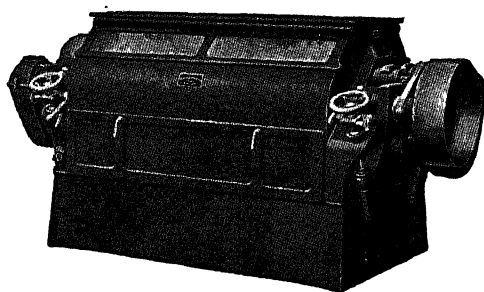
Flour Mill. Sectional drawing showing the construction of the diagonal roller mill

grooving, ranging from 10-26 per inch. The rolls may be 9 or 10 ins. in diameter, and 15 to 60 ins. long, the speed of the fast or cutting roll being 350 r.p.m., the bottom holding roll rotating 2½ times as slowly. There are usually four or five break roll passages with a sieving process between each to pass the released endosperm particles into the remaining milling processes, where they are graded according to size into

whole process from raw grain to flour sack is automatic.

**Flow.** Term used in metallurgy to describe the effects of certain types of deformation on metals. When a metal is submitted to stress, it first deforms elastically, but once the elastic limit has been exceeded plastic flow takes place and the metal becomes permanently distorted. Although this seems similar to the flow of water, there is no question of liquefaction of the metal, as flow takes place at temperatures far below the melting point and is really analogous to the flow of ice in a glacier. One well-known example from ancient times is the movement or creep of lead down roofs of cathedrals and churches.

A metal is built up of crystals and each crystal is composed of a group of atoms in a regular pattern; in many metals the pattern is cubic. If a series of such adjoining cubes be considered, the atoms seem to be arranged on crystallographic planes, along which shear or gliding or slipping might be expected to take place more readily than along planes with atoms irregularly spaced. In fact slipping takes place on certain planes so that the metal moves in "blocks"; this block movement forms steps on a polished metal surface, which may be seen under a microscope as straight lines. In a normal metal of many crystals, slip starts in only a few; this movement redistributes the stress and other crystals become affected. Eventually the grain boundaries change in shape and the crystals become elongated in the direction of flow, giving a characteristic "flow structure," with all the long,



Flour Mill. Diagonal roller mill containing two pairs of chilled iron rolls rotating at differential speeds  
 Courtesy of Thos. Robinson & Son, Ltd., Rochdale

semolina, middlings, and dunst. These granular stocks are purified by a combination of sieves and air currents which plant light particles of bran fragments over the sieves. The sieves grade the purified stocks to the various smooth reduction rolls, which have a differential speed 5 : 4, the top fast roll being driven at 250 r.p.m. They reduce the granular stocks into flour in successive stages and also flatten any germ or bran particles present. Where it is desired to mill the germ into the flour, finely fluted rolls are used on certain passages. The

fibrous crystals packed parallel to each other. The mechanism is not yet clearly explained.

Plastic flow takes place more easily at elevated temperatures, though still well below the melting point of the metal. In industry metals are caused to flow by such processes as forging, drawing, extrusion, and rolling. These processes may be carried out either hot or cold. *See* Annealing; Deformation; Elasticity.

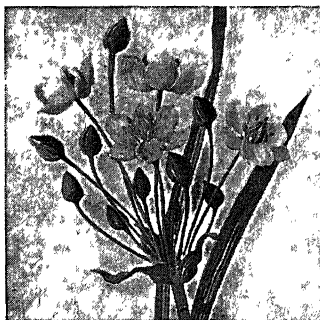
**Flower** (Lat. *flos*, stem, *flor*-, flower). Part of a plant containing the organs of reproduction. In the complete flower it consists of four distinct whorls of organs, which differ in form and number in different species; one or more of the sets of organs being sometimes absent. The lower or outer set are the calyx-leaves, which form the bud of the unopened flower; separately they are known as sepals, and are usually green. The second series are corolla-leaves, mostly brightly coloured, separately known as petals. The third series are stamens, consisting of a stalk or filament and the anthers, the latter containing pollen—the male cells. The fourth series is the pistil, which consists of the ovary, containing ovules or seed-eggs, surmounted by a stigma or stigmas which may be supported by stalks or styles. Grains of pollen caught by the sticky or rough surface of the stigma send out tubes which penetrate the style and fertilise the ovules, which then develop into fertile seeds.

Sometimes the sepals are all joined together and can only be spoken of as the calyx. Similarly, the petals may be united to form a tube, and be funnel-shaped, bell-shaped, urn-shaped, etc. Where there is no distinction between sepals and petals (as in the crocus and daffodil) the floral envelope is termed the perianth. In the Gymnosperms (Conifers) there are neither sepals or petals; and in other forest trees these organs are often very small and inconspicuous, because the pollen is carried by the wind. As a general rule, where the petals are brightly coloured the pollinating agents are insects—mainly bees, butterflies, and moths. Each particular type of flower has its own group of pollinating insects.

In the majority of such specialised flowers nectar-producing glands are so placed as to make certain the transfer of pollen from one flower to the stigma of another by insect agency. So also the streaks, or lines of dots, of a

second colour on the petals point to the position of the nectar. The long tubes of certain flowers (tobacco, convolvulus, etc.) are related to the long probosces of the larger moths and butterflies; broad, open flowers like buttercups to beetles, etc. The perfume emanating from flowers attracts insects—bees, butterflies, and moths. On the other hand, some flowers, such as those of the stapelias, arum family, etc., emit fetid odours attractive only to flies, which are their pollinating agents.

**Flower, Sir** (WALTER) NEWMAN (b. 1879). British publisher and man of letters. Born at Fontmell Magna, Dorset, July 8, 1879, he was educated at Whitgift School, and joined the publishing firm of Cassell's in 1906, later becoming director, a position he resigned in 1946. Known for his monographs on composers, e.g. Sullivan, 1927, Schubert, 1928, he possessed a fine collection of books, MSS., etc., relating to Handel, his biography of that composer appearing in 1923. Flower, who was knighted in 1938, also edited the journals of Arnold Bennett, published in 3 vols., 1932–33.



Flowering Rush. Foliage, buds, and flowers of *Butomus umbellatus*

**Flowering Rush** (*Butomus umbellatus*). Perennial marsh herb of the family Alismaceae. A native of Europe and Asia, it has a stout, creeping rootstock, from which the slender leaves rise erectly to a height of 3 ft. or 4 ft. The tall flower-scape is leafless, and bears at its summit an umbel of many rose-red flowers, each 1 in. across, of which only a few open at one time.

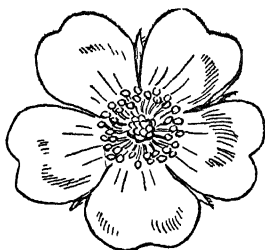
**Flower of Jove** (*Lychnis flajovii*). Perennial herb of the family Caryophyllaceae. A native of Europe, it is covered with white, silky hairs, and has lance-shaped, stem-clasping leaves in pairs. Each branch of the stems ends in a small cluster of purple or scarlet flowers of the campion (*q.v.*) type.

**Flowers, LANGUAGE OF.** Custom said to derive from the East, by which a particular sentiment is attributed to every flower, so that a bloom or posy may convey a message. Little volumes in which the language of flowers was set out were popular in England in the mid-part of the 19th century. Gorse, for example, indicates enduring affection; jonquil, reciprocated affection; eglantine, I wound to heal, etc.

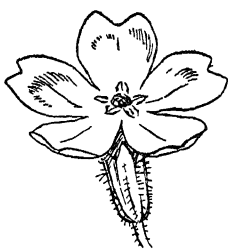
**Flower Show.** Horticultural exhibition, held for the purpose of encouraging the cultivation of plants, flowers, fruit, and vegetables. Exhibits may be competitive or non-competitive. The Royal Horticultural Society holds shows at fortnightly intervals throughout the year at Westminster. Local societies exist in most towns and many villages, annual shows being held, usually in Aug. or Sept. Hundreds of allotment associations also hold annual shows. In general the regulations for a flower show in the U.K. should be those laid down in the R.H.S. publication, Rules for Judging, but it may be advisable to require a smaller number of specimens than that specified for London shows. The schedule committee should avoid ambiguity in the wording of the classes, and use the expressions "kind" and "variety" correctly. The conditions under which challenge trophies are to be awarded should be clearly defined.

In selecting produce for exhibition the size of fruit and vegetables should be that which is best for table use. Beyond a certain point, size may become a defect. Only one variety should be shown in a dish or vase, unless a mixture is specifically asked for. Uniformity of specimens composing a dish is regarded as meritorious; unevenness in size or colour is a fault. With fruits the natural bloom should be preserved, and polishing of, e.g., apples should tell against an exhibit. All vegetables should be perfectly clean, but root vegetables should be washed carefully. The use of oil to produce an appearance of freshness should be regarded as a fault. All produce should be labelled with the varietal name, as information enhances the educational value of a show.

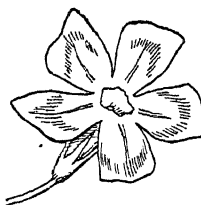
The most important flower show in the U.K. is the annual exhibition held in May in the grounds of the Royal Hospital, Chelsea, and known throughout the world as Chelsea Flower Show. There nearly all the exhibits are non-



Regular wild rose



Salver-shaped primrose



Rotate or wheel-shaped periwinkle



Campanulate or bell-shaped harebell



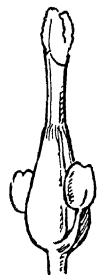
Funnel-shaped : bindweed



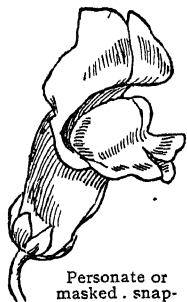
Trumpet-shaped : honeysuckle



Labiate or two-lipped . dead-nettle



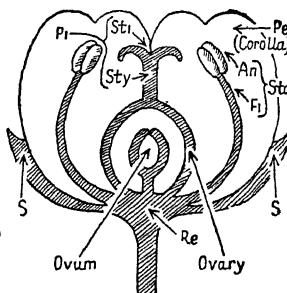
Apetalous or without petals : ash



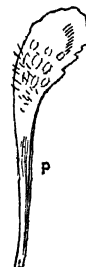
Personate or masked . snap-dragon



Papilionaceous or butterfly-shaped : sweet pea



Diagrammatic section of flower. An, anther; Fi., filament; Pe, petals, Pi, pistil; Re., receptacle. S sepals (calyx); Sta, stamen; Sti., stigma; Sty., style



Flower of pink. P., petal; C., calyx, showing arrangement of hidden parts



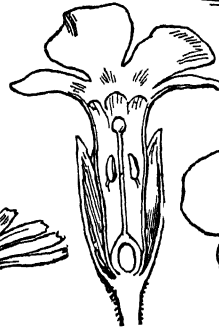
Dioecious or unisexual willow; left, male; right, female



Trumpet-shaped : daffodil  
C., corona; S, spathe



Section of composite flower with florets crowded on disk; F., floret



Superior ovary : primrose



Inferior ovary . flower of apple

**FLOWER: DIAGRAMS OF THE STRUCTURES OF FLOWERS AND THEIR PRINCIPAL PARTS**



competitive, and include not only large groups of plants, flowers, fruit, and vegetables, staged in huge marquees, but also rock and formal gardens constructed in the open, and displays of every conceivable horticultural requisite, from a flower vase to a conservatory and from a budding knife to a motor tractor.

**Fludd** OR **FLUD**, **ROBERT** (1574-1637). An English physician and mystic. Born at Bearsted, Kent, he was educated at S. John's College, Oxford, and took his degree of M.D. at Christ Church. He studied chemistry abroad, where he adopted many of the views of Paracelsus (*q.v.*). Returning to England in 1605, he became a fellow of the College of Physicians. Known as "the Searcher," under the name of Robertus de Fluctibus, he wrote many works in Latin, engaged in controversy with Gassendi, Kepler, and Mersenne, and is believed by some to be the inventor of the barometer. As the supposed author of the *Summum Bonum*, 1629, and an apology for Rosicrucianism, 1617, he is credited by De Quincey with being "the immediate father of Freemasonry." He founded a philosophy on the Hebrew scriptures. He died in London, Sept. 8, 1637. See Freemasonry; Rosicrucians; consult also Robert Fludd, *Life and Writings*, J. B. Craven, 1902.

**Flüela**. Mt. pass of Switzerland, in the canton of Grisons. It extends between the Schwarzhorn and the Weisshorn, on the carriage road from Davos to Sus. On the latter mt., at an alt. of 7,835 ft., is the Flüela hospice. The road has refuge galleries, used in winter.

**Flüelen**. Village of Switzerland, in the canton of Uri. It stands at the head of Lake Uri, a S.E. extension of Lake Lucerne, 2 m. N.N.W. of Altdorf on the St. Gothard rly. The port for Altdorf, it is the terminus for lake steamers. The Axenstrasse carriage road, constructed in 1863-65, leads from here to Brunnen. The village has a château and several hotels.

**Fluellen**. Character in Shakespeare's *Henry V*, a Welsh officer in the king's army. Of hasty temper and verbose speech, he is ever ready to compare the fighting of his day with that of the ancients.

**Flügel Horn**. Brass instrument. It is similar to the cornet, but of wider bore, like the bugle, and of mellow, horn-like tone. It is a modern improvement of the key bugle. The soprano instrument is the most usual. The term means wing horn. See Cornet.

**Fluid**. That form of matter which takes the shape of the vessel containing it and is characterised by its inability to resist permanently any applied shear stress, however small. Liquids and gases are both known as fluids; a liquid is distinguished by possessing a free surface if it does not completely fill the containing vessel, whereas a gas expands to take up all the available space. Furthermore a liquid is much less compressible than a gas. The distinction between a solid and a liquid is not always easily defined, for some so-called solids actually flow, although at a very slow rate. The flow of pitch at room temperatures is an example, and even lead can be made to flow under certain conditions. See Flow.

**Fluid Measures**. Nearly all fluid measures have been derived from corresponding measures of length or weight and suffer all the variations of the latter which were taken from parts of the human body. It is only within comparatively recent times that fluid measures have become standardised by law in different countries. In the United Kingdom the gallon is the unit measure for fluids, and in countries where the metric system is standardised the litre is the unit. A gallon contains a little over four and a half litres. See Weights and Measures.

**Fluke**. Group of trematode worms of parasitic nature, usually leaf-shaped. One, the liver fluke (*Fasciola hepatica*), in its adult condition lives in and devours the liver of the sheep, causing the much-dreaded "rot." The eggs pass out of the body of the sheep with the dung, and if they fall in a wet place hatch out into tiny ciliated embryos that swim about in search of a small water snail (*Limnaea truncatula*), perishing in about eight hours if unsuccessful. Within the body of such a snail other stages of life are passed, until finally one shaped like a minute tadpole is attained (*cercaria*). This leaves the snail and swims to a stem or leaf of grass, to which it attaches itself, and passes into an encysted or dormant stage. Its tail

has gone, it is covered by a hard coat, and resembles the adult fluke except in size.

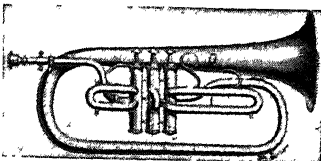
Should a sheep swallow one of these capsules or cysts, the resistant covering is dissolved by the gastric juice, and when it passes into the small intestine the tiny fluke makes its way up the bile-duct into the liver of its victim, there to increase in size and become sexually mature. The disease may be entirely prevented by keeping sheep away from damp, ill-drained land. As there is no cure for the disease, sheep showing signs of rot should be slaughtered as soon as possible. See Sheep.

**Fluoranthene** OR **IDRYL** ( $C_{15}H_{10}$ ). Substance found in coal-tar and in the residue known as "stuppfeet" obtained after the distillation of mercury ores. Crude pyrene from coal-tar is converted into the picric acid compound, whence the fluoranthene is obtained in the free state and re-crystallised.

**Fluorescein**. An aniline dye formed by heating five parts of phthalic anhydride with seven parts of resorcinol at a temperature of 200° C. When the reaction has taken place the mass becomes solid and forms a dark-brown cake. The solution in alcohol or alkalis exhibits a brilliant yellow-green fluorescence from which the substance takes its name. It is used as a dye for wool and silk—but the colour is not fast—and for preparing the liquid in druggists' show bottles. The sodium salt is used in ophthalmic practice to render visible damaged portions of the transparent cornea of the eye.

**Fluorescence**. The property possessed by many organic or inorganic substances of emitting visible light when subjected to ultra-violet radiation. If this emission continues after the removal of the source of the ultra-violet rays, the phenomenon is called phosphorescence (*q.v.*). Both classes of substance are included under the term phosphors (*q.v.*). Synthetic inorganic phosphors are outstandingly efficient, but many natural minerals fluoresce and a few show phosphorescence.

All having a crystalline structure, their fluorescence is believed to be caused usually by the presence of an impurity, such as copper or manganese, in the lattice. This impurity is known as an activator. Ultra-violet radiation excites these fluorescent centres by increasing the energy of certain electrons. After excitation the electrons return quickly to their normal



Flügel Horn. Improved model of B flat horn

By courtesy of Hawkes & Son

condition, giving up the induced energy in the form of visible light. In phosphorescence the energy of excitation is stored before being released in a similar manner.

Although at least 60 mineral species have shown fluorescence (including uranium and other radio-active minerals), only two, scheelite and powellite, invariably fluoresce. As scheelite is an important ore of tungsten and often resembles the worthless minerals with which it commonly occurs, its fluorescence has been used as a means of detection and for prospecting. Portable short wave ultra-violet lamp units are used underground in several mines. The colour of the emitted light may vary for the same mineral; scheelites have been examined which fluoresce with a blue, yellow, or brown colour; fluor spar often gives a purple; some calcites pink; uranium minerals, yellow or green. Crude petroleum is fluorescent, and oils can be correlated with specific sand beds by their fluorescent colours. Applications of fluorescence in biology, medicine, etc., are numerous. Consult Fluorchemistry, J. de Ment, 1945.

**Fluorescent Lamp.** Method of illumination. Attempts were first made over a century ago to design a discharge tube that would act as a practical illuminant. Moore in 1904 came near success with his long tube of up to 180 ft., supplied by a high voltage transformer, but two difficulties still had to be overcome. The light efficiency was not sufficiently high in comparison with other lamps, and the residual gas filling of nitrogen or carbon dioxide gradually disappeared. Both defects have been removed by the modern fluorescent lamp.

It was found by Claude in 1910 that if one of the inert gases (helium, argon, neon, krypton, or xenon) was used as the residual filling, this disappearance was almost negligible. The addition of mercury to neon, or to neon and argon mixed, improved the efficiency and the colour, while the vacuum remained sufficiently constant for at least 1,000 hours. Secondly, the discharge from these gases was found to contain a large ultra-violet component, and a coating of special powder on the inside of the tube makes use of the invisible rays by fluorescing brightly, greatly increasing efficiency and enabling the colour to be widely varied.

The first powders were sulphides of zinc and other metals; but

more efficient "phosphors" of silicates and tungstates were discovered by J. T. Randall in 1936. The improvement is indicated by the luminous output in lumens per watt: Gas-filled filament lamp—11 Ln/W; fluorescent lamp using "green" sulphide coating—15 Ln/W; fluorescent lamp using "green" silicate coating—50 to 60 Ln/W. The modern Jenkins lamp uses pure neon, with coating of zinc orthosilicate or calcium tungstate, and possesses long life as well as high efficiency. Standard dimensions of the tubes for indoor lighting are 9 ft. long by 20 mm. diameter, but other lengths and shapes are made. Consumption is about 40 to 60 W. Many shades of colour may be obtained, including daylight.

To start these lamps, a striking voltage from 1.5 to 2 times the running value is necessary. The two voltages are obtained automatically by the use of a series choke, or by designing the step-up supply transformer with a high leakage reactance. A few seconds after switching on the tube has fully lit up, and the voltage becomes normal. Shorter and more powerful lamps are used for outdoor illumination.

**Fluorides.** Salts of hydrofluoric acid. They are prepared by acting on a metal, or its oxide hydroxide or carbonate, with hydrofluoric acid. Calcium fluoride ( $\text{CaF}_2$ ) occurs native as fluor spar or "blue-john," and from it most of the preparations of fluorine are made. The fluorides of the alkalis are soluble in water and are employed with mineral acids or acetic acid in the processes of etching glass. Some fluorides are gaseous at ordinary temperatures, but most are stable bodies, and are not decomposed by heat. A series of double fluorides is known. Fluorides are recognized by the evolution of hydrofluoric acid on heating with sulphuric acid.

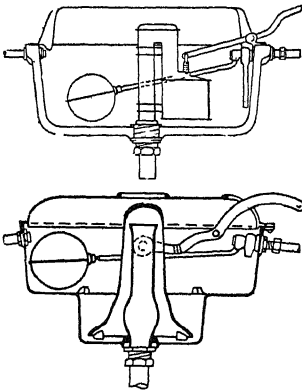
**Fluorine.** Gaseous element of greenish-yellow colour, first isolated by Moissan in 1886. Its chemical symbol is F; atomic weight 19, atomic number 9, boiling point  $-187^\circ \text{C}$ . Derbyshire-spar or "blue-john" is calcium fluoride. Cryolite, a double fluoride of aluminium and sodium, is found in Greenland, and the element occurs widely throughout the mineral kingdom, but only in small amounts. Scheele in 1771 first recognized that fluor spar is a fluoride of calcium and prepared hydrofluoric acid, but all attempts to prepare fluorine were unsuccessful before 1886. It was liquefied in

1897 and solidified in 1903. The difficulties to be faced in preparing fluorine are very great on account of the extremely active chemical affinity it has for glass and most metals. Traces of the gas are very irritating to the mucous membrane, and if brought into contact with the skin the gas causes a bad burn. Alcohol, ether, benzene, and turpentine take fire on contact with fluorine. Moissan isolated the element by the electrolysis of anhydrous hydrofluoric acid to which acid potassium fluoride had been added in order to make the liquid conduct the electric current. One compound of fluorine and hydrogen is known, and one oxide,  $\text{F}_2\text{O}$ , has been prepared. Although fluorine is akin to chlorine in many properties, there are no fluorine compounds corresponding to hypochlorites and chlorates.

**Fluorite or Fluorspar.** The natural form of calcium fluoride ( $\text{CaF}_2$ ), crystallising in the isometric system. It occurs as colourless, green, blue, purple, or yellow crystals, generally massive. It has an excellent cleavage, is fairly soft, and often fluoresces blue in ultra-violet light. Fluorite is a common accessory mineral in sedimentary (dolomites and limestones) and acid igneous rocks; also found associated with ores of lead, silver, zinc, and tin, in mineral veins. Fluorite is used as a flux in the making of steel; in the manufacture of opalescent glass and enamels, and the preparation of hydrofluoric acid. The dark blue variety from Derbyshire, "blue-john," is used for ornaments.

**Fluoroscope.** Apparatus for the analysis of clear liquids and various materials as they fluoresce when exposed to ultra-violet light. Certain chemicals have the quality of fluorescing, or glowing, when X-rays strike them. Thus, if a plate covered with zinc sulphide is held on one side of a human hand, and an X-ray tube is operating on the other side, the bones of the hand will be outlined on the plate as shadows. As the X-rays do not penetrate the denser bone structure as intensely as they do the flesh, the bones show up as shadows on the plate. This principle is used in fluoroscopes for examining the interiors of objects. Commercial fluoroscopes can detect flaws in metals, alterations in documents, and the contents of cases and packages passing through the customs. Minerals subject to the action of a fluoroscope glow with light and colour which in ordinary daylight is unsuspected.

**Flushing.** The action of cleansing a sanitary fitting or drain by a sudden flow of water, usually from



Flushing. Fig. 1 (top). Section through bell-siphon flushing cistern. Fig. 2 (below). Section of inverted U-tube siphon flushing cistern

a cistern fitted with hand-operated or automatic discharge mechanism. Cisterns used with water closets have 2 to 3 gallons capacity as determined by the water supply authority. The flushing mechanism is commonly of a waste-preventing design, capable only of siphonic discharge.

Two typical arrangements are shown in Figs. 1 and 2. Siphonic action is induced by the movement of a small quantity of water down the vertical stand-pipe that passes through the bottom of the shell. The fall of this water sets up a slight downward movement of the air within the stand-pipe and the flush pipe connecting the cistern with the fitting it serves. This momentary lessening of air pressure within the stand-pipe provides the lack of balance necessary for siphonage. In consequence, the atmospheric air pressure bearing upon the surface of the water in the cistern is able to force the whole content of the cistern upwards into the stand-pipe and down the flush pipe.

In Fig. 1, the lever action that raises the bell must be followed by a quick release action, so that the descending bell may splash the requisite quantity of water into the stand-pipe. The better and quieter arrangement of Fig. 2 operates on the pull of the lever. This action raises a valved plate inside the wide, open-ended cylinder, and so lifts the water above the plate over the inverted U-tube and into the stand-pipe.

Compact flushing valves regulated to discharge only a predetermined quantity of water frequently

require a greater pressure of water than is ordinarily available. Automatic flushing is largely confined to public urinals, and to drains that cannot be laid with a self-cleansing gradient. These are commonly fed with a drip supply of water regulated to flush a urinal every 15 to 30 minutes, and to provide a drain flush once or twice in 24 hours. Several automatic flushing devices resemble the bell and stand-pipe arrangement of Fig. 1. In an automatic tank, the water would rise above the fixed, parallel-sided bell, and compress the air in the stand-pipe till the sudden discharge of this air established a siphonic discharge action.

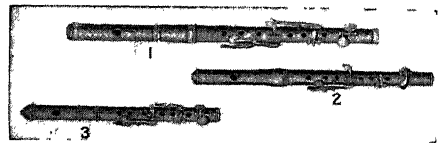
**Flushing** (Dutch, *Vlissingen*). Seaport of Holland. On the S. coast of the island of Walcheren, it lies at the mouth of the Schelde, in the province of Zeeland. In normal times it is linked by steamer with Harwich and Folkestone and has through rly. connexion to Rotterdam, Amsterdam, and the N. of Europe generally. Except for ship-building and some rly. workshops, the town has little trade, but it is of considerable strategic importance, as its history shows. It also developed before the First Great War as a sea-bathing resort. Pop. 22,554.

In the history of the Netherlands Flushing was often prominent, especially as a naval base. It was the birthplace of Admiral Ruyter, 1607, and on the sea wall there is a monument to him which survived the Second Great War. The town was severely bombarded by an English fleet under Lord Chatham in the Walcheren expedition of 1809, but the subsequent attempt to capture Antwerp from there failed completely. The town suffered badly in the Second Great War, its port being completely

destroyed by Allied bombing and deliberate wrecking by the Germans. The dykes on both sides of Flushing were repeatedly bombed on Oct. 7, 1944, British and Canadian forces subsequently landing at Flushing on Nov. 1 and clearing the town of Germans on Nov. 4. Rly. connexion with the N. of the Netherlands was restored in the autumn of 1946.

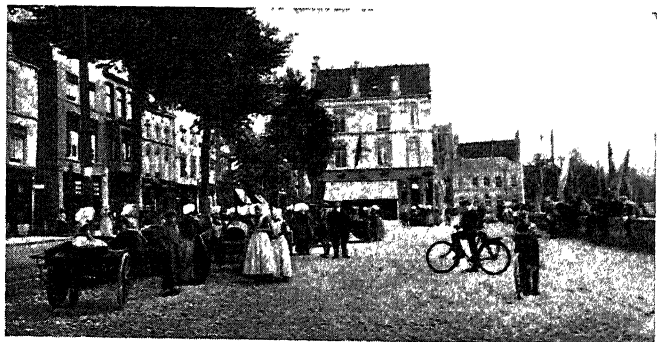
**Flute** (Lat. *flatus*, blast). Family name of many wind instruments of the whistle type, whether blown vertically through a mouthpiece or transversely through a side hole.

Down to the end of the 18th century the number of flutes employed in the orchestra was uncertain, and on account of their weak tone several of them were often used in unison; but the modern instruments are so much improved that it is now customary to employ them singly, and the two (or occasionally three) flutes of the modern orchestra play independent parts. Flutes have been made at various



Flute. 1. Military flute, 19½ ins. 2. Military fife, 15 ins. 3. Piccolo or octave flute, 12 ins.

itches, but the scale of the open finger-holes is always called D. The transposing of flutes, other than the concert flute of ordinary pitch, has been usually reckoned from D instead of from C. Originally, the six finger-holes were the only means of obtaining a scale, and chromatic notes had to be made by cross-fingerings, half stops, and other unsatisfactory means; but key after key has been added until now all the semitones are producible, in good tune and with even tone. The convenient compass of the concert



Flushing. Dutch housewives in the fish market on the Nieuwendijk, a view taken before the Second Great War

flute is as shown, and three semitones higher are possible. The flute is the most agile of the wind instruments, modern mechanism having reduced finger difficulties to a minimum. Flute is also the name of an organ stop imitating the tone of the orchestral instrument of the same name. A flûte-à-bec is a beaked flute, or flute with a mouthpiece, played vertically. See Fife; Flageolet; Organ; Recorder.

**Fluting.** In architecture, flutes are grooves in a column, separated usually by fillets. Fluting is generally vertical, but spiral fluting occurs in Norman architecture. See Architecture; Column.

**Fluvial Deposits** (Lat. *fluvius*, river). In mining geology, term for deposit of minerals dissolved from primary sources by streams etc., and laid down in concentrated masses. Such mineral concentrations are richer than those found in eluvial deposits (see Eluvial Deposits), in the formation of which flowing water plays no part.

In geology, fluvio-glacial deposits are those layers of mud, etc., thrown up by streams emerging from the terminations of glaciers. According to the slope of the glacier and the speed of its streams, the deposits' layers vary, but the

must be removed as a slag to give clean, reduced metals. By themselves these earthy substances are usually too refractory to allow easy fusion and so fluxes must be added to combine with them, producing an easily melted, free-running slag, readily separated from the molten metal. If the ore is acidic, basic fluxes, e.g. limestone, iron oxide, or soda, are required to combine with the silica, etc., while a basic ore needs acidic substances, such as quartz or sand. Neutral fluxes, such as fluorspar or borax are sometimes added to lower the melting point of the slag. Similar considerations apply in refining and melting. Welding, brazing, and similar joining operations require fluxes to break down oxide films, and to protect the hot joint from the atmosphere. An example is the use of zinc chloride for tinning. See Gangue.

**Fluxion.** Term used by Sir Isaac Newton to signify the rate at which a "fluent" (or variable) increased or decreased at any given instant. The fluxion is thus the derivative of the fluent with respect to time ( $\dot{x} = dx/dt$ ;  $\ddot{x} = d^2x/dt^2$ , etc.). See Differential Calculus; Newton.

**Fly.** Insect of the order Diptera, characterised by having only fore wings, the hind pair being modified into balancers, or *halteres*, which resemble minute drumsticks. These are sensory organs that enable the insect to maintain

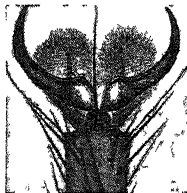
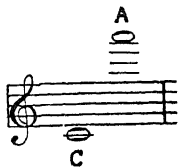
equilibrium in the air. Removal of the halteres causes some flies to lose their power of balance when in flight; others fall aimlessly to the ground. The mouth-parts are adapted for sucking up liquid food, and in mosquitoes and horseflies they include sharp lancet-like organs which enable the insects to pierce the skin of man and other vertebrates in order to imbibe blood. The pathogenic agents of such virulent diseases as malaria, sleeping sickness, yellow fever, and elephantiasis are transmitted to man through blood-sucking flies.

Flies undergo complete metamorphosis: their larvae are always devoid of legs, and those of the house-fly and blowfly, for example, are without an evident head and are known as maggots. In gnats or mosquitoes, and among midges, the larvae are aquatic, and are variously modified to suit that mode of life.

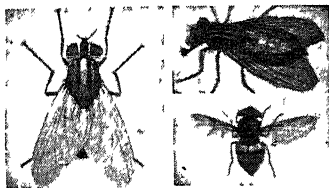
In several families, the larvae are parasites living in the bodies of mammals (botflies and warbleflies), or in other insects (tachinid flies). The larvae of many flies are injurious to food crops, notably those of the craneflies, known as leather-jackets; the fruitfly, to oats; the goutfly, to barley; and the beet or mangold fly. About 85,000 different species of flies are known, over 5,200 kinds occurring in the British Isles. See House-Fly.

**Fly.** The largest known river of New Guinea or Papua. It rises among the Victor Emmanuel Mts. in the E. part of the island, and flows S.W. and then S.E. to discharge its waters into the Gulf of Papua by a long, wide estuary. For part of its course it forms the frontier between Dutch and British New Guinea. It has a length of about 620 m., and is navigable for small craft nearly all the way. The principal affluents are the Alce and Strickland rivers.

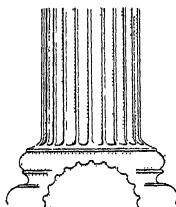
**Fly-agaric** (*Amanita muscaria*). Large toadstool of the family Agaricaceae. It has a creamy-white stem and gills, the former with a broad soft frill around its upper part. The upper side of the cap is orange-scarlet, flecked with irregular particles of white—the remains of an outer envelope. Well known as a poisonous species, it was formerly employed for



Fly. Foot of house-fly, highly magnified



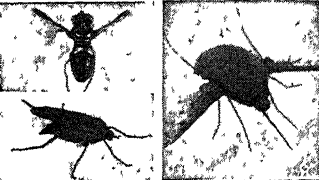
coarsest elements always fall nearest the glacier or, if discharged into water, at the base of a conical mass which is topped by the least coarse.



Fluting in Ionic column; inset, plan of fluting

**Flux.** Material used in metallurgical smelting, refining, brazing, soldering, and welding operations, to remove unwanted matter or to protect the metal from the atmosphere.

Mixed with the metalliferous portion of an ore, there are many other gangue minerals, which



Fly. 1 and 2. House-fly, *Musca domestica*. 3. Girded-drone fly, *Volucella inanis*. 4. Gold-girdled fly, *Chrysotoxum bicinctum*. 5. Dung fly, *Scatophaga stercoraria*. 6. Humble-bee fly, *Bombylius major*. 7. Pupae of house-fly.



Fly-agaric. The poisonous scarlet toadstool, *Amanita muscaria*

poisoning fly-papers. It has also intoxicating properties, and is used in Kamchatka in preparing vodka.

**Flycatcher.** Name of family (*Muscicapidae*) of small birds, including nearly 300 species. All feed upon insects, which they usually catch on the wing. The tail is in most species considerably shorter than the wing, and

while the European species are plainly clad in sombre hues, some of the tropical ones are very gorgeous. The pied flycatcher (*Ficedula hypoleuca*) comes to Great Britain in the spring, the spotted flycatcher

(*Muscicapa striata*) in the summer, and the red-breasted flycatcher (*Siphia parva*) is occasionally seen in autumn. See Egg, colour plate.

**Fly Fishing.** Fishing with an artificial fly. The flies are made of feathers, silk, tinsel, fur, and other materials. Trout-flies, especially those used in the dry-fly method, are made to resemble as closely as possible some form of fly or other aquatic insect.

The fly, which is attached to the line by a cast of gut of a thickness varying with the shyness of the fish, the colour of the water, and other conditions, may be either sunk deeply in the water, or fished wet near the surface, or floating. The opinions of experts differ about the value of colour in artificial flies, as compared with their size and form, but all agree that the principal factor in success is the way in which the fly is presented to the view of the fish. Recent experiments in underwater photography have done much to confirm the view that, when fished "dry" or floating, the important factor is the fly's silhouette as seen against the light.

It is essential in fly fishing for the angler to keep himself and his rod out of sight of the fish, and this condition is usually ensured by keeping low when fishing up or across a stream, and by using a long line when fishing down stream or casting over a loch. Correct casting requires skill which can be attained only by practice. Where the surroundings permit, the rod can be kept up and the cast made overhead; it can also be made underhand, or the line can be got out by the Spey throw or other such methods, such as the downward cut employed against the wind. The best sport to fishermen with the fly in the United Kingdom is given by salmon, sea-trout, brown trout, and grayling.

Fly fishing with natural flies is another method, but, owing to the difficulty of keeping them on the hook when casting, the method of dapping is employed. The fly is dropped on the water and raised

again with a short line, or a long rod is used with a light blow-line, taken out by the wind. See Angling; consult also Fly Fishing, K. Rollo, 1946; New Lines for Fly Fishers, W. B. Sturgis and E. Taverner, 1946.



Flycatcher. The pied flycatcher, a spring visitor to Great Britain

**Flygare-Carlén, EMILIE SMITH** (1807-92). Swedish novelist. Born at Stroomstad, Aug. 8, 1807, in 1827 she married Axel Flygare, and was left a widow in 1833. She published her first novel, Vladimir Klein, in 1838, under the pseudonym "Fru F." In 1841 she married John Gabriel Carlén, lawyer and man of letters, and continued to write stories, largely concerned with the life of the Norwegian coast. She died at Stockholm, Feb. 5, 1892. Many of her novels have been translated into English, including *The Rose of Tistelön*, 1844; *The Birthright*, 1851; *The Guardian*, 1865. Her collected novels were published in 31 vols., 1869-75, and her *Reminiscences* in 1878.

**Flying-Boat.** A class of sea-going aeroplane, the essential feature of which is a boat-like hull. The majority of modern seaplanes, especially the larger designs, are flying-boats; float seaplanes or floatplanes being the other main division.

The hull provides buoyancy on the water, and also takes the place of the fuselage of the landplane,

normally accommodating the crew, passengers, and/or freight or armament. The flying-boat has small wing-tip floats which may be retractable in flight, or alternatively sponsons on the side of the hull itself. Flying-boat designers and operators have adopted many of the terms of marine engineering, including keel, chine, bow, stern, etc. The keel has one or more steps breaking its outline; a flying-boat takes off from and alights on the planing bottom, which is in advance of the front step. The engines and airscrews must be kept clear of spray, and these are therefore slung high; the same applies to the tail surfaces.

As a flying-boat is independent of runways and airfield restrictions, many of the world's largest aircraft have come into this category—examples were the Dornier Do X of 1929, which once carried 169 passengers, and in 1947 the Hughes Hercules (wing span 320 ft.), a major experiment in ship-building as well as aeronautical engineering. The most notable British flying-boat and the largest standard R.A.F. aircraft during the Second Great War was the Short Sunderland (see Aeroplane illus.; Sunderland), a military development of the outstanding commercial Empire boat. The Vickers-Supermarine Walrus was an amphibian flying-boat, with a retractable wheeled undercarriage permitting operation from land airfields, aircraft-carriers, or the water. See Seaplane.

**Flying Bomb.** Name given to a jet-propelled weapon used during the Second Great War. Experiments were made in Great Britain in 1916 and in the U.S.A. in 1918 with pilotless aircraft, and in Great Britain about 1926-27 with a radio-controlled pilotless bomber called Larynx, but none of these was further developed. During the Second Great War, however, the Germans invented what they called *Vergeltungswaffe Eins* (V 1, or Reprisal Weapon One), giving it the code number FZG-76. Frequently referred to in Great Britain as the V 1, it was officially named in that country the flying bomb. Other names, more colloquial, included buzz bomb and doodlebug.

The flying bomb had several wing variations. One model had 16-ft. span wings, tapering in plan from the body to cut-back wing tips; the other had parallel chord 17½-ft. span wings. Sharp steel strips were fitted inside the wings' leading edges to cut

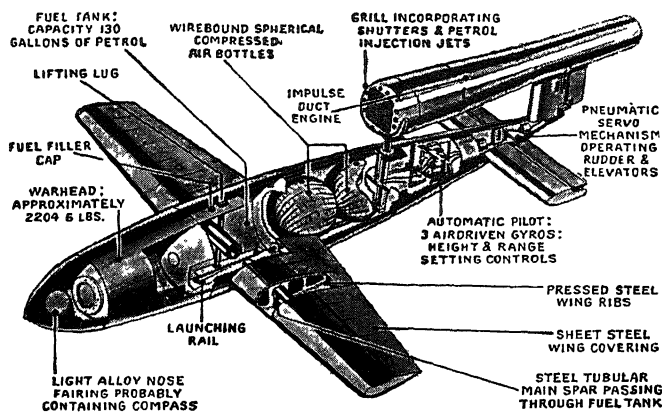
balloon cables. No model had ailerons. Other dimensions were: fuselage, length 21 ft. 10 ins., and maximum diameter 2 ft. 8½ ins.; propulsion unit, 11 ft. 3 ins. long, 1 ft 10½ ins. maximum diameter; the jet tube projected behind the rudder, and the overall length was 25 ft. 4½ ins.; tail plane span, 7 ft. 5 ins. Almost entirely of mild-steel sheet, the nose section, containing the magnetic compass, was of duralumin, to reduce compass deviation. Gross weight was 4,700 lb. made up thus: shell, about 1,800 lb., explosive 1,870 lb., fuel about 950 lb. with tankage for about 130 gallons.

The propulsion unit was a simple welded-steel casing mounted above the rear of the fuselage on a front fork and on the fin aft. Air, compressed at very high initial pressure and contained in two wire-reinforced spherical bottles, forced fuel from the tank through pipes running up the front support of the propulsive-unit. This fuel was sprayed into the combustion chamber through nine atomiser jets arranged in three rows of three between a venturi grill. Three compressed-air jets for starting the engine were mounted above the topmost fuel jets. In front of the jets was a square "honeycomb" of non-return valves made of 126 double leaves of pen-nib steel, with each double leaf pressing its two inner edges together. In front of this honeycomb was the circular air intake.

The fuselage contained six sections for the compass, warhead, fuel tank, air bottles, gyroscopes and controls, and servo-motor. Under the fuel tank centre-section a fore-and-aft launching rail with thick metal sides tapered from front to rear.



Flying Bomb. The machine climbing after being launched from its ramp on the French coast



Flying Bomb. Sectional drawing of the pilotless plane used by the Germans to bombard London in the summer of 1944

Flying bombs were brought from assembly shed to launching ramp on a trolley. A derrick travelling on rails, one on either side of this ramp, lifted them on to the ramp by the lug above the wing spar. The gyroscopes were driven by compressed air from the air-bottles in the adjoining section. Bearings from the repeater compass in the nose were used to maintain the course through the master gyroscope (*see* Automatic Pilot). A pre-set aneroid barometer controlled the height of flight, and an air log set to the estimated distance governed range.

Launching was controlled from a blast-proof control-house about 30 yards from the upward inclined ramp, and was effected by a piston driven by compressed air within a cylinder that ran the full length of the ramp. A sprag on the piston projected through the upper wall of the cylinder and engaged with the launching rail of the flying bomb. At the end of its run on the ramp the flying bomb rose abruptly into the air, and climbed to its pre-set height before flying level. But not all flying bombs started successfully; a number fell back, causing damage to the launching sites and injury among the launchers.

Launching speed was about 185 m.p.h., and had to exceed 170 m.p.h. to open the air valves and start the normal operational cycle of the engine. During flight, the air log was rotated backwards by a calibrated air-screw of about 12 ins. diameter mounted in front of the fuselage nose. When the estimated range had been flown and zero reached on the log detonators attached to the tail plane were electrically fired. These forced down two

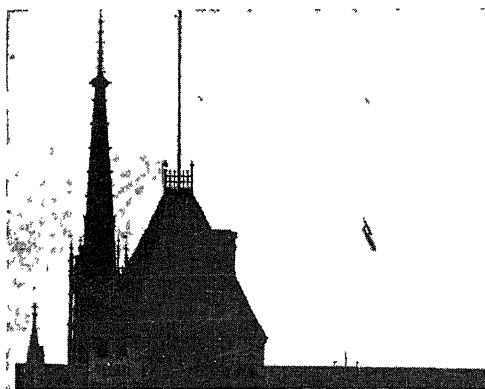
control tabs, which in turn forced the bomb into a dive. The warhead had (1) a sensitive impact fuse; (2) a universal mechanical fuse with one switch at the nose and another under the warhead to detonate if the flying bomb should glide into the ground; and (3) a clock fuse to explode the bomb after two hours should the others fail. A few weapons carried small radio transmitters, enabling German receiving stations to plot their flight.

Exploding on contact, the flying bomb made only a small crater when it landed on open ground, but the lateral blast covered a much wider area than did that of bombs of deeper penetration.

Early in 1943 British Intelligence learned through information supplied by foreign workers forced to labour in Germany that Germany was preparing a long-range weapon to bombard London. Through agents the zone, and through R.A.F. reconnaissance the exact site, of the principal experimental station was located at Peenemünde (*q.v.*), near Stettin, on the Baltic coast.

Air reconnaissance also revealed large ferro-concrete structures at Watten, in the Pas-de-Calais, and about 100 smaller structures behind the French coast between Le Havre and Calais. It was presumed that these were for the launching of jet-propelled weapons, while it was thought that the large structures were to fire rockets. All launching ramps pointed towards London. The R.A.F. and the U.S.A.A.F. heavily attacked both Peenemünde and the launching ramps, destroying all these permanent launching sites, and forcing the Germans to build





smaller but less efficient launching structures which could be rapidly assembled and camouflaged.

Just after 4 a.m. on June 13, 1944, two Royal Observer Corps members on duty at Dymchurch, Kent, spotted a flying bomb approaching, identified it instantly, and reported within 35 secs.; it proved to be the first missile of an intensive attack lasting seven weeks, and twice reaching a maximum of 200 bombs a day, aimed at London. Plans made to meet the anticipated attack were immediately put into effect.

The flying bombs flew at a height of between 800 and 2,500 ft. at a speed varying with the direction of the wind from 320 to 400 m.p.h. This was both higher and faster than had been anticipated, and they proved difficult targets for the heavy A.A. guns detailed for the defence. The defences were therefore swiftly reorganized. (See Anti-Aircraft Command.)

Beyond the coastal gun belt, fighters had the task of destroying flying bombs which had passed the guns. They found the best method of attack in a dive at an acute angle from behind, which gave them speed in excess of the bomb. Determining the range at night was difficult, until Prof. Sir Thomas Merton invented a simple range-finder, costing about one shilling. Four types of fighter aircraft were used: the Tempest, Mustang, Spitfire XIV, and the jet-propelled Meteor. They destroyed 1,900 flying bombs, Tempests with a total of 578 brought down proving most effective, Spitfires next with over 300.

A curtain of barrage balloons, eventually totalling some 2,000, was set up to the S.E. of London, between Godstone in Surrey and the Thames near Woolwich. Their cables brought down 278 flying

bombs. (See Balloon Defences.)

Very few flying bombs were launched from France after Sept. 4, by which date the Germans in the Pas-de-Calais had been cut off from their bases by the advance of the Allies. It was estimated that from June 13 to Sept. 4, 1944, a total of 8,070

But the main attack by flying bombs was switched against Antwerp (*q.v.*) and, during the German counter-attack in the Ardennes in Dec., 1944-Jan., 1945, to Liège.

**Flying Buttress.** In architecture, a half arch used to transmit the thrust or pressure of a structure, usually a vault, to a main buttress or solid foundation. Flying buttresses were first used in France in the 12th century, and formed a principal decoration of the exterior of French cathedrals. See Buttress.

**Flying Column.** Body of lightly equipped, mobile and self-supporting troops which operates for

short periods at a distance from its base. Such bodies are necessary when armies are engaged over a wide theatre of operations or are employed in suppressing guerrilla warfare. Flying columns are frequently detached from the main army to go to the relief of a beleaguered garrison. During the Second Great War the most notable were the Long Range



Flying Bomb. Its pre-determined range having been reached close to London's Law Courts, a flying bomb dives to earth and explodes in a cloud of black smoke. These photographs were taken from a Fleet Street roof in July, 1944

flying bombs had been launched, sometimes singly and sometimes in waves. 25 p.c. were erratic or inaccurate, and 46 p.c. were brought down by the triple defences. On Aug. 28, 97 out of 101 launched were destroyed. During the last fortnight of the main attack, only 45 p.c. of the bombs launched crossed the English coast.

Croydon was the worst-hit borough (See Croydon illus.), Wandsworth the worst-hit London borough. Several flying bombs fell in Norfolk, and one fell at Northampton. Flying bombs destroyed in S.E. England 23,000 houses, damaged more than 1,100,000.

After the main attack was over, a few flying bombs arrived from a more easterly direction, including a number which fell in S. Lancs on Christmas Eve, 1944. These were all launched from adapted Heinkel 111 bombers. Bomber Command attacked the aerodromes from which the Heinkels operated, intruder fighters patrolled the Dutch and Belgian coasts at night, and guns were deployed in the zone of the Thames estuary.

Desert Group (*q.v.*), which carried out raids behind the enemy lines in N. Africa, and the Chindits (*q.v.*), who performed similarly against the Japanese in Burma.

**Flying Dutchman, THE.** Spectral ship traditionally haunting various seas. It is generally associated with the latitude of the Cape of Good Hope, about which it was said to be ever moving under crowded canvas, unable to reach port. The vessel was supposed to be thus doomed owing to the abominable acts of her crew headed by their captain, Vanderdecken. Her appearance is deemed a portent of disaster. The legend was dramatised in *The Flying Dutchman* by Douglas Jerrold, 1829, and later by Edward Fitzball; Captain Marryat founded on it his story, *The Phantom Ship*, 1839; and it inspired Wagner's opera, *The Flying Dutchman*, 1844.

**Flying Fish.** Any member of several groups of tropical fishes. Many species have the pectoral fins so lengthened as to resemble wings. They are in the habit of leaping out of the water to escape their

enemies, and taking long skimming flights above the surface, supported by their distended fins, which are not used as propelling agents.

**Flying Fortress.** American heavy bomber of the Second Great War. Known to the U.S. army as the B-17 and officially designated Fortress in the R.A.F., the first model of this Boeing bomber in operational service in Europe proved under-armed<sup>1</sup> and could carry only 12,800 lb. of bombs. Later types, the B-17E, F, and G, formed the backbone of American bomber strength, especially in mass daylight raids on Germany. Improvements included an armament of at least twelve 5-in. machine-guns, and a standard bomb-load was 6,000 lb. The four engines were of the 1,200-h.p. Wright Cyclone type; wing span was 103 ft. 9 ins., length 74 ft. 9 ins. From the same designers came the much larger Superfortress (*q.v.*). See *Aeroplane* *illus.*

**Flying Fox.** Erroneous name for the fruit bat, of the genus *Pteropus*. It is due to the fact that the head slightly resembles that of a fox. Unlike other bats, which it greatly surpasses in size, it feeds entirely on flowers and fruit. It is found in S. Asia, the E. Indies, Madagascar, Australia, and some of the Pacific islands. The largest species, that of Malaya, *Pteropus edulis*, measures over 5 ft. between

Flying Fox: the Malayan species

the tips of the wings, and is considered a great delicacy. The fruit growers of Australia suffer much from its depredations. The name is sometimes wrongly given to the Flying Phalanger (*q.v.*). See *Bat*.

**Flying Lemur** (*Galeopithecus*). Popular name for the cobago of Malaya, only member of the order Dermoptera. The loose skin along the sides of the body and neck spreads into a kind of parachute when the animal launches itself into the air, enabling it to cover at one bound as much as 70 yds. from tree to tree. It feeds on leaves.

**Flying Officer.** Commissioned rank in the R.A.F. above that of pilot officer and immediately below

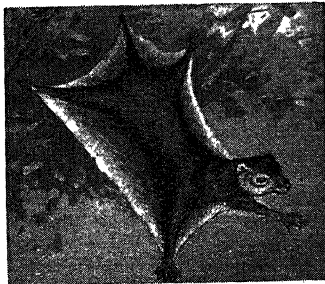
that of flight lieutenant. It replaced the rank of observer officer in 1930. A flying officer's rank is indicated by a single ring, slightly wider than that of a pilot officer, on the sleeve or epaulette.

**Flying Phalanger** (*Petaurus*). Small squirrel-like opossum, of which there are three species, found only in Australia and New Guinea. It is able to take long gliding leaps through the trees, partly supported by a membranous extension of skin. It feeds upon insects, fruit, and blossoms.

**Flying Speed.** Normal speed which an aeroplane must maintain in order to remain in the air, or the actual air speed of a machine necessary for its support in the air. This must not be confused with the apparent or ground speed of the machine. See *Air speed*.

**Flying Squad.** Mobile section of a police force equipped with fast cars for dealing with smash-and-grab thieves and sudden outbreaks of crime. The first flying squad was established by the London metropolitan police in 1919, and similar organizations were adopted throughout Great Britain. Flying squad cars, which bear no outward indication of their police duties, are equipped with concealed radio which enables them to keep in constant touch with headquarters.

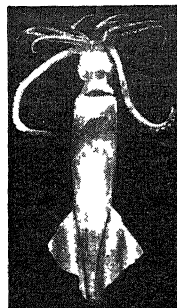
At New Scotland Yard there is a plotting table which shows the position of every car on patrol. When a crime is reported to the control room, the time and place of its commission, with any available details of the criminal, are transmitted by radio to the squad car nearest to the scene. With the development of television, experiments have been made in the transmission to cars of photographs of wanted criminals. The picture appears on a small panel on the dashboard and remains there until another message is transmitted. Autogiros have been introduced into the flying squad,



Flying Lemur, *Galeopithecus*, with skin distended for gliding

primarily to assist in traffic control, but also to direct converging squad cars.

**Flying Squid** (*Ommastrephes sagittatus*). Species of squid or



Flying Squid. A cuttle fish which springs out of the water

cuttle fish. Long and narrow in shape, it is common in the open seas, and forms an important part of the food of the sperm whale. It is often called the sea arrow, from its habit of darting backwards out of the water for a considerable height.

**Flying Squirrel** (*Pteromys*). Name given to a number of species found in N. America, Asia, E. Europe, and Africa, and not closely related. Members of this group are able to simulate flying by the ex-



Flying Squirrel of North America. It is nocturnal in habit

tension of the loose, lateral folds of their skin. All are nocturnal in habit. See *Squirrel*.

**Flying Training Command.** Organization established by the R.A.F. in May, 1940, for the training of pilots, observers, and air-gunners. The command was in six groups, one of which dealt with initial training for all categories of air crew; two with elementary flying training; two with service flying training; and the sixth included the observer, bombing, and gunnery schools. Central flying schools, from which R.A.F. flying instructors must qualify, were also in this command. Men passing out of the Flying Training Command were posted to operational training units, where bomber crews were formed to train as teams in aircraft actually on operational service. In 1947 the command was equipped with Boulton Paul jet-propelled training aircraft.

**Flying Wing.** Aircraft consisting of a single triangular wing. The fuselage is integral with the wing and does not normally project beyond the leading and trailing edges. The aircraft has no tail assembly of fin and rudders, small vertical surfaces being mounted at

each wing tip. Aircraft of this type can be powered by either piston engines or jet turbines. During the Second Great War the American Northrop company tried an experimental all-wing aircraft known as the N.I.M., and in 1946 produced a 104-ton tailless bomber for the U.S.A.A.F. In Great Britain the Armstrong Whitworth company, experimenting with flying wings, designed a commercial aircraft to carry a payload of 130,000 lb. at 400 m.p.h. The main advantage of the tailless aircraft is the reduction of structural weight and air resistance. This advantage, however, is scarcely appreciable in aircraft of less than 250,000 lb., hence the great size of all projected aircraft of the flying wing type. See *Aeroplane illus.* p. 136.

**Flysch.** Geological formation. It consists of enormously thick series of sandstones and shales, occurring in the Alps, Apennines, Carpathians, Istria, Dalmatia, Bosnia, Greece, Asiatic Turkey, Caucasus, stretching through S. Asia and still farther East. Their exact age is uncertain, but varies from lower Cretaceous to middle Tertiary. They represent a phase of deposition of sediments of long duration and great geographical extent.

**Flywheel.** In engineering a rimmed wheel mounted on a shaft which is subjected to, or has to exert, a turning effort more or less intermittently. The turning moment (or torque) of an engine on the driven shaft varies during a revolution, the variation depending upon the number and arrangement of cylinders and cranks. If the resisting moment due to the work being done by the driven member is constant, the speed will increase while the driving torque is in excess of the mean, and will decrease while this torque is below the mean. The fluctuation of speed during a revolution due to an increase or decrease of torque decreases with increase of inertia of the rotating parts and can be reduced to any desired small amount by the provision of a flywheel having sufficiently large inertia. This inertia is increased by either increasing the mean diameter of the rim or increasing the weight of the rim, or by both methods. Work is done by the wheel when its speed is reduced, and additional work is stored in the wheel when its speed is increased.

The effect of a flywheel in reducing speed fluctuations is greater at high revolution speeds than at

low speeds; it varies with the square of the revolutions. Thus a high speed petrol engine requires a very much lighter flywheel than, say, a slow speed gas engine of the same power to keep the speed fluctuation low. In some cases (e.g. in marine engines), the inertia of the rotating parts of the engine added to that of the driven member (propeller and shaft) supplies all the flywheel effect required. In some motor vehicles a hydraulic clutch, acting on the principle of the Froude dynamometer, is incorporated in the flywheel, which is known as a fluid flywheel.

**Foal.** Young of the horse and of the ass, of either sex. The term colt has come to be appropriated to the young male animal; filly, a diminutive of foal, to the young female, but formerly the distinction was less rigid. The word is connected ultimately with Gr. *pólos*, foal, and Lat. *pullus*, young animal.

**Foch, FERDINAND** (1851-1929). French soldier. He was born at Tarbes, Oct. 2, 1851, and educated at St. Étienne, at the Collège St. Michel, under Jesuit direction, and at the Collège de St. Clément at Metz. From early years history was his favourite reading.



*F. Foch*

Having enlisted during, but seen no service in, the Franco-Prussian war of 1870, he returned to Metz, but soon entered the engineering and artillery establishment at Fontainebleau. In 1874 he was attached to the 42nd regt. of artillery at Tarbes. Two years later he took a course at a cavalry school at Saumur, and in 1878 became captain of the 10th regt. of artillery. He was picked for the school of war in 1885, and on leaving was appointed to a divisional staff. He was transferred to the general staff in 1894, and later became professor of military history, strategy, and applied tactics at the École Supérieure de Guerre. His lectures there brought him some fame, the bulk of them being collected in two books, *The Conduct of War* and *The Principles of War* (the latter trans. H. Belloc, 1918). Their general argument is that though the art of war is simple, few can acquire it, as its execution demands the highest will, purpose, and strength in a commander who can impart them to his soldiers.

In 1901 Foch was sent to command a regiment. It has been said that his religious beliefs, and the fact that a younger brother was a Jesuit, were the causes of this apparent setback. However, in 1903 he became full colonel, in 1905 chief of staff to the 5th army corps, and in 1907 brigadier-general with a position on the general staff. Clemenceau then offered him the command of the École de Guerre, where he spent an invaluable 4½ years, greatly admired by his pupils. In 1911 he became general of division, in 1912 of the 8th army corps, and in 1913 took command of the 20th army corps at Nancy.

On four critical occasions during the earlier part of the First Great War Foch proved his principles in action: in the abortive French offensive and subsequent defence of Nancy, Aug., 1914; on the Marne, Sept., 1914; with the British at Ypres, Oct., 1914; and on the British right flank on the Somme, July, 1916. It was from the Marne, while in command of the new 9th army which he had formed with great speed and thoroughness, that he sent his famous dispatch: "I am heavily pressed on my right; my centre is giving way; I cannot redistribute my forces. The situation is excellent; I am attacking."

On Sept. 30, 1916, Foch reached the age limit, was awarded the *médaille militaire*, and withdrawn from any particular command, though retained on the active list. In Dec., 1916, he became director of a bureau for the study of inter-Allied problems, and pressed for the creation of a strong Allied reserve. Early in 1918 it was decided to place him in command of such a reserve. Then, as the result of the critical German offensive of March 21, which drove a wedge between French and British, a momentous inter-Allied conference was held at Doullens (March 26), at which Foch was appointed generalissimo of all Allied forces fighting on the western front.

After checking the final German offensive between Reims and Soissons, he launched his decisive counter-offensive on the Marne on July 18, which ceased only with the German demand for an armistice. On Aug. 6 he was made marshal of France. The first German request was made on Oct. 28. Foch communicated with the German plenipotentiaries by radio, met them at Rethoules on Nov. 8, and ensured their acceptance of conditions which he had been

engaged in drawing up for some weeks. On Nov. 11, the day the armistice came into operation, marking the defeat of Germany, the French deputies unanimously voted that Foch had "deserved well of his country."

In Paris on July 14, 1919, he led his victorious troops through the newly reopened gates of the Arc de Triomphe de l'Etoile, and on July 19 rode with Haig at the head of the victory parade in London. Foch never lost his essential calm and poise, which gave to all who met him the sense of a man possessing an inexhaustible reserve of confidence, founded on force of will and clearness of intellect in effective combination. He died on March 20, 1929, and was buried in the Invalides, Paris.

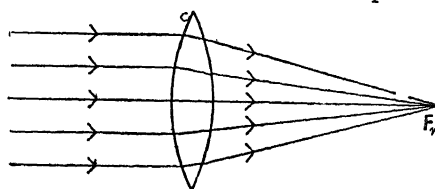
His memoirs were published in an English trans., 1931. There are lives by Sir G. Aston, 1929; B. H. Liddell Hart, 1931. Consult also Foch Talks, Cmdt. Bugnet, 1929.

**Focke-Wulf.** German aircraft manufacturers, with main works at Bremen. Apart from an experimental helicopter, Focke-Wulf attracted little attention until the Second Great War. Two of their products then achieved world fame. The four-engine Fw 200, already in use as a commercial transport and named Condor, was militarised as the Kurier, and, with a range of over 2,300 m. and usually armed with two 20-mm. cannon in addition to machine-guns and  $1\frac{1}{2}$  tons of bombs, was used for Atlantic reconnaissance and anti-convooy attack. Wingspan, 108 ft.; engines B.M.W. or Bramo radials.

The Fw 190, introduced in 1942, became the most successful single-seat fighter of the Luftwaffe. Its compact design (span 34 ft., length 29 ft.) and all-round performance owed much to the then new 1,600-h.p. B.M.W. 801 radial engine. The armament of four 20-mm. cannon and two machine-guns was at that time outstanding. Later the Fw 190 was powered by a 1,700-h.p. Junkers in-line unit—the so-called "long-nosed" Fw 190. The final Focke-Wulf fighter to reach the squadrons was the Ta 152, a completely fresh design capable of over 460 m.p.h. This had an exceptional span of wing to aid high-altitude interception. Long-range tanks, bombs, or rockets could be carried on all these types. See Aeroplane illus. p. 132.

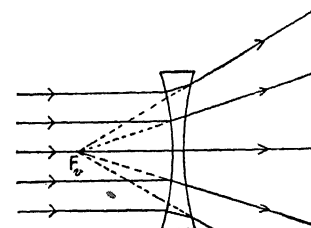
**Focus.** The point at which converging rays meet. A virtual focus is the point from which diverging rays are considered to be directed.

With light rays the two cases are respectively illustrated by means of convex and concave lenses.



**Focus.** Fig. 1. Convex lens causes light rays to be brought to a real focus ( $F_r$ )

Fig. 1 shows parallel rays of light striking a convex lens and being brought to a real focus  $F_r$ , while Fig. 2 indicates that a concave lens causes the incident rays to



**Focus.** Fig. 2. Concave lens produces an apparent or virtual focus ( $F_v$ )

diverge so that they appear to come from the virtual focus  $F_v$ . The distance from the focus (or focal point) to the lens is known as the focal length.

In mathematics a focus is a point from which, if lines are drawn to any points on a curve, the lengths of these lines conform to some law. In medicine, it is a part of the body where a disease originates or is most active. In photography, and in the use of such instruments as the micro-

scope and telescope, focusing is the operation by which the lens is so positioned as to give the maximum crispness of detail and definition. The adjustment may be made visually or in conformation to a predetermined scale of distances. See Camera; Lens; Photography.

**Fodder.** Name applied to the bulky part of the food of stock.

Coarse fodder crops, also known as forage, include cereal straws, meadow hay, seeds, and clover hay, all characterised by a high fibre content but useful in promoting a feeling of repletion in the animal. They are distinguished from the green fodders such as pasture grass, lucerne, sainfoin, clover, and green maize, which have a great deal of leafage and are often given in a green condition; lucerne, sainfoin, and clover also making excellent hay. Succulent fodders include mangolds, turnips, swedes, carrots, parsnips, and kohlrabi; in addition to the leaves, the roots of some of these crops are valued for the dry matter they contain, which varies from 8 to 9 p.c. in turnips to 15 p.c. in mangolds and 25 p.c. in sugar beet. About two-thirds of the dry matter exists in the form of readily assimilated sugar.

**Foetus** (Lat., offspring). Biological term meaning the young of an animal, usually with reference to a visible embryo either in an egg or within the womb. The term is applied to that stage of the development of the embryo after its various parts can be distinguished up to the period of birth. See Embryology.

## FOG: OBSCURITY IN THE ATMOSPHERE

A. J. Drummond, F.R.Met.S., and David Le Roi

*An explanation of the causes, nature, and varieties of fog is followed by a description of fog signals; also of methods of air navigation in fog and of fog dispersal*

Obscurity in the surface layers of the atmosphere due to the condensation of water vapour as surface clouds, or to smoke held in suspension in the air, constitutes fog. Meteorologically, the term is limited to conditions when objects as near as one km. are not visible. In country districts fogs result purely through condensation, in industrial areas smoky atmospheres produce the well-known yellowish-black fogs, and in desert regions dust fogs occur. High fogs, where condensation takes place one or two thousand feet above

the surface in a layer containing a great amount of smoke, are observed over large cities, particularly London. In such instances it may be as black as night overhead without significant reduction in the horizontal visibility.

Radiation fogs, formed by the cooling of the surface layers of air below the dew point, although generally of short duration may be extremely dense, especially in river valleys and grassy hollows. When the sun's heat is sufficiently powerful this type of fog thins out rapidly. Another kind of fog forms

when warm air flows over cold ground, or when mixing of two currents of air at different temperatures occur. Thus, off Newfoundland, the warm air over the Gulf Stream produces dense fogs when it meets the cold air over the Labrador Current. Land fogs are formed mostly during winter months; sea fogs are characteristic of spring and summer. Although the upper boundaries of fogs are often not sharply defined and may continue upwards as clouds, the height is usually less than 1,000 ft. Mist is fog in a lesser degree.

**NAVIGATION IN FOG.** Fog signals of the type used at sea and on board ship are purely warning devices, not intended to enable shipping to continue under way; in crowded waterways shipping normally stops in heavy fog. There are, however, devices to allow ships to navigate in bad visibility. Many large liners are equipped with a cathode-ray oscillograph. Vessels moving in a fog area automatically transmit every 15 secs. on a wavelength of 600 metres short signals lasting approximately 1/100th of a second; these signals are picked up by all similarly equipped ships and appear as lines on the oscillograph screen. According to the direction of the lines on the screen protractor, it is possible for the receiving vessels to establish the relative course and bearings of all transmitting ships within range.

Another device is the fog camera, developed during the First Great War. Fitted to the ship's bridge, this camera automatically takes photographs every minute by infra-red rays which penetrate fog and smoke. The films are automatically developed and fixed in 50 secs., and by pressing a button at the side of the camera the officer of the watch instantly illuminates the latest negative. The camera has disclosed objects 6 m. distant when visibility was virtually nil. It is not so effective at night, when it will pick up only such objects as ships, lighthouses, and buoys equipped with apparatus for transmitting infra-red ray beams.

Radio beacons and direction finding are described under their appropriate headings. Sonic fog signals are of little use to aircraft, owing to the excessive noise of engine and propeller, but almost all the radio devices used for navigating in bad visibility at sea have been applied to air transport. The *Lorenz Beacon* (*q.v.*) and the

Loran systems have been specially developed.

The increasingly high speed of aircraft, which has steadily reduced the margin of visibility, even in clear weather, has equally steadily increased the risks of navigation in fog, and Feb. 1, 1938, the Air ministry brought into practice a system of one-way "roads" to govern flying in fog. Known as the directional system, it operates when horizontal visibility is less than 1,100 yds., and provides that machines flying in different directions shall fly at different altitudes.

Over the area covered by air routes between Great Britain and the Continent, the whole air space above 19,000 ft. is reserved for regular liners; while over the rest of England, Scotland, and N. Ireland the scheme operates above an altitude of 3,300 ft. Above that height the air space is divided into four horizontal zones; 3,300–6,600 ft., 7,000–10,600 ft., 11,000–14,600 ft., and 15,000–18,600 ft. The zones are thus separated from one another by a margin of 400 ft., and each zone is divided into 12 layers, in one of which the aircraft must fly during fog according to the magnetic bearing of its pilot's course. (*See Navigation; Radio.*)

**FOG SIGNALS.** Signals of warning to traffic during fogs. The highest development of sonic devices for use when atmospheric conditions obscure normal visual signals has been achieved in the spheres of sea and rail transport. Board of Trade regulations require all vessels at anchor in fog to ring bells at one-minute intervals. Steamships under way sound sirens every minute; sailing ships may use horns or whistles. Audible warning to vessels moving in coastal waters in fog is given either by

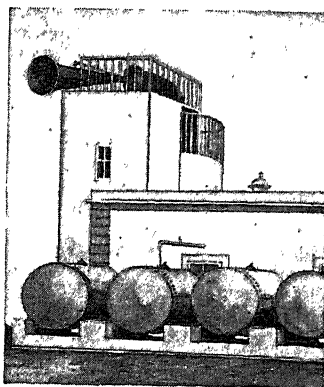
bells mounted on buoys, or by fog-horns operated in conjunction with lighthouses.

Modern fog-horns on the coast are mechanically operated, the sonic portion consisting of two cylinders, one of which moves over the other. Both cylinders have a number of perforations which during rotation periodically coincide, so that the upper holes come over the lower ones. When compressed air or steam is forced through the holes of the upper cylinder at the moment when the holes on the lower cylinder coincide, the air is set in rapid vibration. The result is a loud, deep note which is concentrated and sent in the required direction by a large horn or bell-mouthed tube. The moving parts of the fog-horn are driven either by electric motor or by compressed air. The largest fog-horn of this type is at the Cumbrae lighthouse in the Firth of Clyde, which in favourable circumstances can be heard for 20 miles. The Caskets fog-horn consists of mushroom trumpets attached to sirens and blown by compressed air, which distribute the sound all round the horizon. In the U.S.A. attempts have been made to guide shipping by means of eight fog-horns fixed radially, short and long blasts of Morse being sounded according to the compass direction.

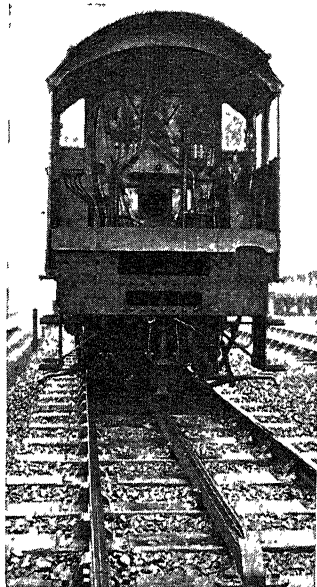
The prototype of the coastal fog signal was the bell used in medieval days, as on the Inchcape Rock (*q.v.*). Bell and whistle buoys (*see Buoy*) are still common, particularly for giving warning of shoals, pierheads, and breakwaters. The bells are operated by the movement of the sea, clockwork, or electric motor, and some can be heard for 14 m. On certain lighthouses, such as Eddystone (*q.v.*), use is made of explosive signals detonated electrically at fixed intervals. On the Clyde are unattended acetylene fog-guns which are switched on and off by a radio transmitter on Gourock pier.

Soundless zones are interposed between near and distant audible zones under certain atmospheric conditions. Hence the utility of submarine bells, placed on the sea floor, buoys, and light vessels, and audible to ships fitted with receiving apparatus. The sound can be picked up from 10 m. away. A similar apparatus is sometimes used with submarine cables.

When fog obscures rly. signals, detonators are placed on the line by fogmen stationed at the ordinary visual signals. The detonator consists of two tin cups fitting



Fog-horn on Little Cumbrae island, in the Firth of Clyde; it is operated by compressed air from the cylinders shown



Fog. Automatic railway fog signal, showing engine contact shoe on ramp

tightly together and enclosing a star-shaped piece of lead in which are fixed five percussion caps, the remainder of the space inside the cups being filled with black powder. The detonators are attached to the rail head by lead clips and explode when the wheels of an engine pass over them. In some sections of the line, particularly at stations and junctions, detonator-laying machines are installed; these are operated from the nearest signal box.

Another rly. fog signal, the audible searchlight, works as follows. About a quarter of a mile in front of the "distant" signal a 40-ft. ramp is placed between the rails and connected electrically with a switchboard in the signal box. Beneath the rly. engine is a shoe, which engages with the ramp, closing an electrical circuit. If the distant signal is set at danger when shoe and ramp make contact, a siren sounds in the locomotive cab. At the same time, the electric impulse conveyed through the ramp opens a valve in the vacuum-brake pipe and automatically brings the train to a standstill. If the distant signal is off when shoe and ramp engage, the switchboard in the signal-box rings a bell in the engine, indicating that the line is clear.

Most large signal-boxes are equipped with a train movement and track diagram to facilitate the signalling of trains in fog.

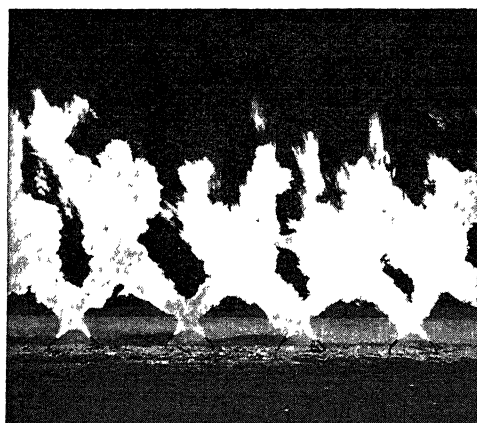
By electric circuits in the permanent way, which are closed by the train's passing over them, a chart of the tracks signalled from the box is illuminated to warn the signalman of all moving and stationary trains.

**FOG DISPERSAL.** Efforts have been made to accelerate by artificial means the condensation of moisture as it comes into contact with the atmospheric particles and so cause fog to fall as rain. Electric precipitation and the sprinkling of electrically charged sand and water from aircraft flying above the fog have been tried, but the clearance is only temporary. In 1938 some success attended experiments conducted by the Massachusetts Institute of Technology. A system of perforated pipes was erected 20 ft. from the ground and sprayed a chemical mixture having the property of dissolving the minute particles of matter constituting fog. At a small aerodrome a dense fog was cleared in five minutes; but dispersal was only temporary. Attempts have been made by the British Association to blow away fog by bombarding the atmosphere with cannon; but the process is unreliable.

Sir Oliver Lodge tried electric dispersal of fog and successfully cleared small areas irrespective of meteorological conditions. Current at a pressure of 400,000 volts was discharged into the atmosphere from a series of high masts.

In 1936 the Air ministry sponsored experiments in dispersal by means of super-heating from radial lamps. The second temperature, or layer of cold air over the warmer, is negated and creates over the aerodrome a pocket of visibility in which aircraft can land. Radial heating has reduced fog up to 40 p.c., but the process is costly.

The high accident rate and the large number of potential flying hours lost through fog early in the Second Great War led to the establishment of the Fog Investigation Dispersal Operation, popularly



Fog. Flames of high pressure "Fido" system burning away fog from the runways of an airfield

known as Fido from its initials. This succeeded in getting rid of fog in bulk by artificial heating of the air. Pipes, through which petrol was pumped at high pressure, enclosed the airfield in a rectangle. At intervals in the pipes burners threw ignited petrol in a flame 2 ft. high.

Initial trials were made in Hampshire on Nov. 4, 1942, when a dense fog was cleared by petrol burners in an area of 200 sq. yds. to a height of 80 ft. The first full-scale test was held at Graveley,

Hunts, a runway 1,300 yds. long by 150 ft. wide being cleared of fog to a height of 100 ft. Fido was used operationally on Nov. 19, 1943, when four Halifax bombers landed in England, after an attack on the Ruhr, in visibility of less than 100 yds. By May, 1945, 2,500 Allied aircraft had been safely brought to ground in thick



Fog. Double fog detonators on railway line, operated by the signal above being at "danger"



fog. Rundstedt's Ardennes offensive of Dec., 1944, was halted largely by the weight of Allied air attack by bombers able to take off and land from fog-bound airfields. Fido consumed 70,000 gallons of petrol an hour, and because of its excessive cost was not easily adaptable to civilian use.

**Fogazzaro**, ANTONI (1842-1911). Italian poet and novelist. He was born at Vicenza, March 25, 1842. His first poems, 1863, were followed by a poetic romance, *Miranda*, 1874, and a volume of lyrics, *Valsolda*, 1876, which established his reputation as a poet. These were succeeded by the stories, *Malombra*, 1882, and *Danielle Cortis*, 1885. In 1888 came his first considerable success, the idyllic *Mistero del Poeta*; then the notable trilogy, *Piccolo Mondo Antico*, 1895; *Piccolo Mondo Moderno*, 1901; and *Il Santo* (The Saint), 1906; the last of which, his most famous work, was translated into most European languages. A staunch Roman Catholic, Fogazzaro sought to reconcile the theory of evolution with the teaching of his church; he has been described as Italy's modern poet of hope and faith. He died March 7, 1911. A *Life of Fogazzaro* by T. Gallarati-Scotti appeared in 1922.

**Fog-bow**. Rainbow of about 40° in arc with a broad white band in place of the more usual middle green-blue. The outer edge appears reddish and the inner faintly violet. It is observed during foggy weather, hence the name. The white band results from overlapping of the refraction colours, due to the smallness of the water drops present in fog. See *Rainbow*.

**Fog Crystal**. Phenomenon observable during fog and frost. Fog crystals are usually formed by particles of ice on surfaces in a fog, in frosty weather, as the fog is driven over those surfaces. These crystals, most common in hilly districts, are feathery in appearance, often reach several feet in thickness, and form with great rapidity in favourable conditions.

**Foggia**. A province of S.E. Italy, formerly known as *Capitanata*. In Apulia, bounded N. and E. by the Adriatic Sea, it has an area of 2,683 sq. m. Mountainous in the N.E. and W., it has in the central part a fertile plain. The coast is low and flat, and the climate hot and dry. There are numerous rivers, the chief of which is the *Candelaro*, with many tributaries. The lakes of *Lesina* and *Varano* lie in the N. of the

prov., and the Lake di Salpi in the S.E. The highest point is Monte Calvo, 3,460 ft. Vast flocks of sheep are pastured on the plain. Pop. 504,449. *Pron.* Foj-ya.

**Foggia**. City of Italy, capital of the prov. of Foggia. It stands in the centre of the Apulian plain, 78 m. E.N.E. of Naples, and 20 m. S.W. of Manfredonia, a junction of the coast rly. and the lines to Benevento and Potenza. The 12th century Gothic cathedral was partly destroyed by an earthquake in 1731, and rebuilt. An important fair is held every May for the sale of sheep, wool, corn, capers, and cheese. An ancient city, Foggia was a favourite residence of the emperor Frederick II, whose English wife, the daughter of King John, died here. Three miles N. of the city are traces of the ancient town of Arpi, or Argyripa, reputed to have been founded by the great hero, Diomedes. Pop. 62,340.

During the Second Great War, Foggia became important as a centre of air activity. With its 13 airfields, it was captured from the Germans on Sept. 27, 1943, by a mobile column of the British 8th army. It became the base of the U.S.A. 15th A.F., which raided S. German, Austrian, Hungarian, and N. Italian targets from here.

**Fogo** (Port., fire). Volcanic island of the Cape Verde archipelago. Circular in shape, and mountainous in character, it has an area of about 190 sq. m. The loftiest point, the Pico do Lano, nearly 10,000 ft., has often been in eruption, notably in 1847, when it caused immense damage. Fertile in the N., where coffee, sugar, maize, and fruit are produced, Fogo is almost barren in the S. The chief town and port is São Filipe, or Nostra Senhora do Luz —Our Lady of Light.

There is another island of this name off the N.E. coast of Newfoundland in lat. 49° 40' N. and long. 54° 10' W.

**Föhn** (Ger.). The warm dry southerly wind which blows down the leeward slopes of Alpine valleys. The rise necessary to cross the ranges dynamically cools the air, producing rainfall in the mountains. On descending the other side the air, which has lost considerable moisture, is heated by compression and thus reaches the villages as a warm, drying wind. One explanation for the descent of the warm air into valleys already filled with cold air is that the latter is removed by mixing due to turbulence.

Another reason put forward is that the cold air gradually drains away, drawing the warm air downwards into the valley.

This wind in a few hours clears away more snow than many days of bright sunshine, and uncovers the upland pastures. In some valleys the early sowings are entirely dependent upon this wind, whilst in others it is relied upon to ripen the grapes in autumn. Strictly the term should not be used of a wind, but merely of the effect of descent upon a wind. The föhn effect can be recognized in most mountainous areas in temperate latitudes. See *Wind*.

**Föhr**. Island in the North Sea, one of the N. Frisian group, belonging to Germany. It lies off the W. coast of Slesvig, opposite Dagebüll on the mainland, and has an area of 32 sq. m. Largely marshland, protected in the N. by dykes, it is elsewhere elevated and timbered, with fertile soil. The inhabitants live by wild-fowling, fishing, and catering for visitors. The chief town is Wyk, a resort on the E. coast. Pop. 7,000.

**Foie-gras** (Fr., fat liver). Livers of geese enlarged abnormally by keeping the birds in a heated compartment, and made into the paste known as *pâté de foie-gras*. The Strasbourg variety is well known.

**Foil**. Weapon used in fencing. It is a very slender, four-sided steel blade, with a handguard to the hilt, and a button on the tip, the object of the fencer being to touch some part of his opponent's body with that button. See *Fencing*.

**Foil**. In metallurgy, a thin form of metal, which may be said to occupy a position intermediate between a leaf, e.g. gold leaf, and sheet metal. A very thin tinfoil is made for chemical and electrical uses, and for backing mirrors; tinsel is a rather thicker foil much used for theatrical purposes; Dutch foil is specially prepared for the backing of artificial gems, to give brilliance; it is coloured by Prussian blue and other pig-



Foil, fencing weapon, and method of holding

ments. Gold foil has been used by dentists for stopping teeth.

Ordinary commercial tinfoil, largely used for wrapping tobacco, chocolates, other sweets, and toilet articles, is made of lead coated on one or both sides with tin, the two metals being rolled together so that they become quite inseparable. The tin surface may have merely an infinitesimal thickness, yet it is sufficient to prevent contact with lead. The latter metal contributes the substance and the flexibility to the foil; the tin, much the more expensive metal, provides the non-poisonous surface.

Aluminium, with its light weight, makes a thin foil as an alternative to that of lead. A beautiful variegated foil, which we owe to the Japanese, is made by soldering together by their edges 30 or 40 thin sheets of gold, silver, copper, and various alloys; punching or cutting a pattern through these sheets, the holes going to varying depths, then rolling down the "book" of sheets to the desired thinness. The holes disappear in the finished product.

**Foix.** Town of France, capital of the dept. of Ariège. It stands between the rivers Ariège and Arget, 46 m. S. of Toulouse. Its interest is mainly historical, as the capital of the county of Foix. The powerful counts of Foix lived in its castle, of which there are some remains on the rock, round which the older part of the town clusters. The church of S. Volusien dates from the 14th century. There are small industries, and the town is the commercial and administrative centre for a large district. The county of Foix varied in extent from time to time. It was ruled by its counts, vassals of the king of France, and was one of the provs. into which France was divided before the depts. were created. Pop. 6,806. *Pron.* Fwah.

**Fokine, MIKHAIL** (1880-1942). Russian dancer and choreographer. He was born in St. Petersburg (Leningrad) and began his studies as a dancer under Karsavina's father at the imperial school of ballet. He developed his ideas for the reform of conventional ballet, and a meeting with Benois and Diaghilev (*q.v.*) proved eventful, for during the famous season of Russian ballet in Paris in 1909 he produced *Les Sylphides*, *Le Pavillon d'Armide*, *Cléopâtre*, and *Prince Igor*. Among his later ballets were *L'Oiseau de Feu*, *Shéhérazade*, *Le Spectre de la Rose*, *Le Coq d'Or*, *Petrouchka* (considered his masterpiece), and

Paganini. For Pavlova he devised *Le Cygne*. He died in New York, Aug. 23, 1942. *See* Ballet; *consult also* M. F. and his Ballets, C. W. Beaumont, 1935.

**Fokker, ANTHONY HERMAN GERARD** (1890-1939). A Dutch aeronautical engineer. He was born at Kediri, Java, April 6, 1890, and educated at Haarlem, starting his aeronautical career at 20. Fokker became well known after his success in a competition for military aircraft at St. Petersburg. Before the First Great War his designs had been offered unsuccessfully to the British and Italian governments. They were accepted by Germany, and his first biplanes and triplanes gained a great reputation, especially after they had been fitted with an interruptor gear that permitted a machine-gun to be fired through the propeller. After the war he established aircraft factories in the Netherlands, Spain, and New Jersey. Fokker went to the U.S.A., where he died Dec. 23, 1939. His autobiography, *Flying Dutchman*, was published in 1931. *See* Controlled Gun; also *Aeroplane illus.* p. 134.

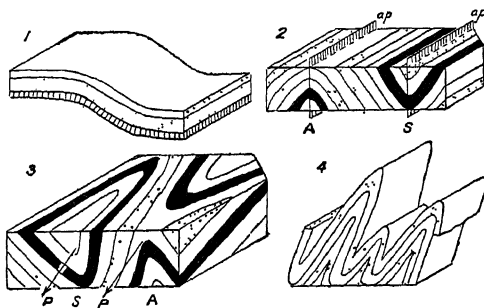
**Fold.** In geology, the warping or bending of strata which were originally deposited in more or less horizontal layers. Folds are caused by earth movements and are usually associated with compressional stresses acting in the crust. A step-like inclination of strata in one direction is referred to as a monocline. The up-arching or down-warping of beds produces anticlines or synclines respectively. These are elongated, like folds formed in a pushed tablecloth, normal to the direction of greatest compression, and in their simplest form can be likened to a sheet of corrugated iron.

Individual folds tend to die out along their lengths; hence their crests or troughs are rarely horizontal. Such folds which have a slope along their lengths are said to pitch or plunge. Intense compression of the beds leads to the asymmetrical development of folds in which one limb is steeper than the other. The folds are then inclined, and with further movement may be pushed further over to

become overturned or even recumbent. Where a fold has been so squeezed that its limbs are more or less parallel it is isoclinal. Dome- and basin-shaped fold structures can be formed as well as the more common elongated types. The outward dip of strata around a dome is termed *quaquaversal*; the inward dip around a basin is *centroclinal*. Folds are of the greatest importance in the economic applications of geology. The formation of slate is usually associated with folding. Artesian water supply is often obtained from synclines, as in the broad basin-like structure of the Chalk below London.

Oil concentrations are commonly located at or near the crests of domes or anticlines.

**Folding Machine.** A machine primarily in use in printing to convert into sections the flat sheet of printed paper as it comes from the press. Before its adoption these flat sheets were folded by hand. Each class of machine varies in its action, but generally the folded sheets are automatically fed up to a side-gauge on the machine bed, and then brought to the correct position by an automatic device to ensure accurate folding. A descend-

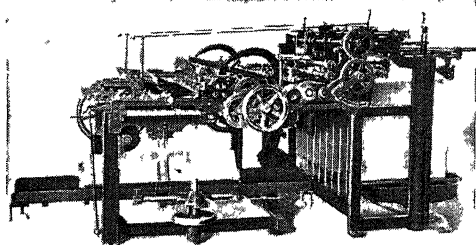


Fold : in geology. 1. Monocline. 2. Upright anticline (A) and syncline (S) with vertical axial planes (ap). 3. Pitching folds, anticline (A) and syncline (S); direction of pitch (P) shown by arrows. 4. Tightly compressed folds becoming almost isoclinal

ing blade then presses the sheet between two revolving rollers through which the sheet passes, thus making the first fold. The sheet then travels to the second pair of rollers, set at right angles to the first pair, where a similar action is performed, and so on for each succeeding fold.

Some machines are made for parallel folding, i.e. folding the sheet over and over in the same direction by blades and rollers parallel with each other operating consecutively. Imagine the first fold down the centre of one way of the sheet and the second fold parallel with the first; we then have the

sheet the original length one way, and one-fourth the original length the other way; a third parallel fold is then made, and as this enters the delivery it is slit into sections by slitting disks. Thus a book of 144 pages, of the page size of this one, would consist of 9 sections of 16 pages folded in the manner last described, 2 sheets each 40 ins. by 54 ins. being converted into 4 sections 10 ins. by 6½ ins. This



Folding machine. Double sixteen book-folding machine, constructed to fold a sheet into two lots of 16 pages, one lot inserted in the other, to make a section of 32 pages

principle of parallel folding is adapted to printing machines producing magazines.

In all the latest styles of folding machines the sheets are fed in automatically, and in some instances sheets are supplied from piles, folded, gathered, stabbed, and the covers glued on before delivery. The uninitiated have probably been puzzled as to the reason of letters in the bottom margin of a book; these are identification marks, and indicate the sections in which the book is folded, thus, the first page of the first section of 16 pp. or 32 pp. will be marked A and the first page of the second section B and so on. These letters enable the sections to be collected in sequence instead of by pagination.

Newspapers are folded by means of an auxiliary part of the printing press. The endless web of paper travels over a V-shaped plate, forming the first fold or spine of the newspaper; the web continues its course (now in page size) until it reaches another section of the machine, the next fold being then accomplished by means of a turning blade attached to and rotating in a cylinder. There are many types of folding machines for the making of boxes and cartons, notepaper folding, etc.

**Foliation.** In geology, a structure characteristic of metamorphic rocks, particularly of schists. It consists of the arrangement of the rock-material in more or less parallel, sometimes lenticular, and frequently undulating layers. Split-

ting usually takes place readily along these layers. See Rock.

**Foligno** (anc. *Fulginium*). City of Italy, in the prov. of Perugia. It stands in a beautiful valley, on the river Topino, 23 m. by rly. S.E. of Perugia, and is enclosed by medieval walls. It has a 12th century cathedral, which has been modernised, several old palaces, and a picture gallery. There is trade in paper, leather, parchment, silk, and soap. An ancient city, Foligno was razed to the ground in the wars of the 13th century. Rebuilt, it was greatly damaged by earthquakes in 1831 and 1832. The cathedral and a palace were damaged and an oratory destroyed by bombs in the Second Great War. The town was entered by Allied troops, June 16, 1944, the Germans having already withdrawn.

**Folio** (Lat. *folium*, leaf). In bibliography, a book of the largest size, the sheets of which are folded once into two leaves, making four pages. For convenience in binding, two or more sheets are inserted into each other. In all but modern books the watermark of the paper is seen in the centre of the page if the work is a folio; if in the middle of the inner margin, divided by the fold at the back of the book, with the chain lines horizontal, the book is a quarto (*q.v.*).

The word folio is applied to the numerical mark on each page of a printed work or each leaf of MS. It is used to indicate the number of words in a page of law writing, or report of parliamentary proceedings, to a case for holding music, and, in book-keeping, to the two facing pages of a ledger or account book containing respectively the creditor and debtor accounts. In 16th century English the word was used to mean "on a large scale." See Book; Paper, Sizes of.

**Folk Dance.** Term for any form of dance native to a people. Originating in religious custom and ritual ceremony, the native dance has continued as a folk dance among peoples long after the religious significance has died out. Many European folk dances are still linked with the old seasonal festivals of pre-Christian days. European folk dances may be roughly divided into two types: (1) ceremonial and ritual dances,

with magical purpose behind the ritual, which were performed by a select group of initiated men, and which retain their ceremonial character and their link with an old seasonal festival; (2) dances performed by the community as a whole, which gave rise to the various forms of social dance which have been the recreation of the people throughout history.

Ceremonial dances, often of a dramatic nature, symbolise fertility, the contest of life and death, and the rebirth of nature in spring. Fertility dances include the English morris or morrice; the Robin Hood games; the Staffordshire horn dance; the hobby horses; and these have their counterpart in Continental folk customs. Contest dances are performed by two opposing lines of dancers, dressed to show their difference in kind: the whites and the blacks, the reds and the blues, the uglies and the beautifuls. Rebirth dances are represented in England by the Northumbrian and Yorkshire variants of the sword dance, which is part of a popular drama, the folk play or mummer's play, with death and resurrection as the central theme. Common to all three forms of ceremonial dance is the practice of actors disguising themselves by masking or blacking their faces.

#### English Folk Dances

Social folk dances no doubt sprang from a festival of general celebration which followed the completion of the ritual dances. Many of the English kind are derived from the early forms of maypole round; others from processional ceremonies, such as the furry dance of Helston. From the old rounds and long dances have grown other types of set dance, including the square of four couples. During three centuries a continual process of exchange of social dances between town and country has exercised influence on the style and manner of dancing. The true folk dance has always been characterised by a natural simplicity and a spontaneous gaiety. Lancers, quadrilles, etc., popular in the ballroom fifty years ago and imported into England from France, are not true folk dances but town versions of the older rustic square folk dance. Examples survive as true folk dances in country places in England and are widespread in America. English country dances that have been popular in town life have been preserved in printed collections since the Stuart days,

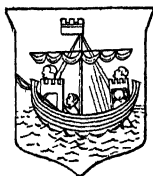
and it is therefore possible to follow their evolution to recent times.

The folk dance in Europe was in danger of dying out with the passing of the peasantry. Societies and organizations were founded in many countries to preserve and revive the folk dances as part of the national tradition.

The music of the folk dance is simple, melodious, and strongly rhythmic. The characteristic instruments used are the whistle, or pipe, and drum. In England this familiar combination, played by one man, was known as the whittle and dub, or pipe and tabor (*pron. tabber*). It is still found in association with the men's morris dances, but mostly it has been supplanted by the fiddle, and more recently by melodeon and accordion. The actual folk tunes used for dancing are variants of folk songs and popular songs of any time, modified by the musician to suit the particular dance. The country dance tunes used for social purposes in town life were of no great musical merit. See Dancing.

Douglas Kennedy

**Folkestone.** Mun. bor., watering-place, and market town of Kent, England.



Folkestone seal

It stands on the English Channel, 71 m. by rly. S.E. of London. For its holiday visitors the many attractions include the Leas—a fine promenade of nearly 2 m. on the W. cliff, commanding a splendid view from 100 ft. high of the sea—Kingsnorth Gardens, and Radnor Park, a public pleasure ground. There are tennis courts, golf links, bowling green, and a racecourse. The bathing is good to the E. of the harbour. Between Folkestone and Dover is a

large open space called the Warren, an extensive landslide, in which fossi's are found.

Folkestone consists of an old town in a valley, now the fishing and shipping quarter, and a newer town on the hills around. The chief church is dedicated to S. Mary and S. Eanswith; it is Early English, with a fine tower, much restored. There are also modern churches and several fine hotels. The town has several good schools, a public library, and a museum. As a seaport Folkestone has been much improved during the 20th century, both harbour and pier having been enlarged. It is one of the chief sailing ports for France (Boulogne).

Folkestone was in existence before the Norman Conquest. It became, and still is, a member of the Cinque port of Dover, and was early a corporate town. There was a monastery here from about 1095 until the time of Henry VIII, and also a castle. Heavy damage was caused by German air raids in

1940. The council still derives a considerable income from the coal dues collected in the port. There are memorials to William Harvey, discoverer of the circulation of the blood, who was born here. Near is Shorncliffe camp. Much of the land belongs to the earl of Radnor, whose eldest son is Viscount Folkestone. With Hythe, Folkestone elects one M.P. Pop. 41,240.

**Folkland.** Name given in England in Anglo-Saxon times to the land that was held by folk or common right and subject to certain established burdens. Until 1893 the prevailing idea was that it was the common land of the nation, as opposed to bocland, which was in the nature of private property; but in that year Prof. Vinogradoff established the modern theory. This assumed that practically all the land of the country was folkland, although the king could by grant convert it into bocland. *Consett Domesday Book and Beyond*, F. W. Maitland, 1897.

## FOLKLORE: ITS ORIGINS AND STUDY

E. S. Hartland, Author of *The Science of Fairy Tales*

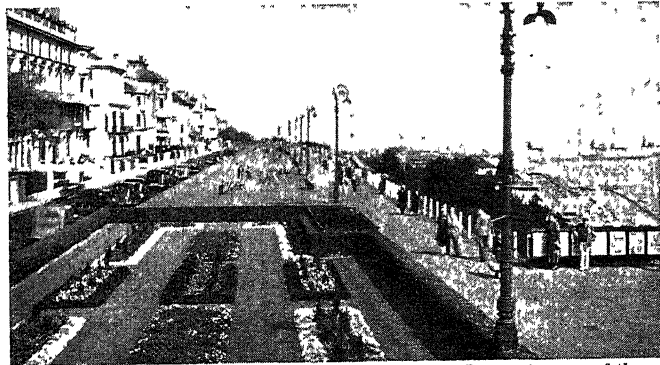
*There are in this work articles on the various characters in folklore, among them Fairy; Genie; Roc; Valkyrie; Witch. See also Legend; Mythology*

The term folklore was suggested by W. J. Thoms, the antiquary, in 1846, to replace the more cumbersome title of popular antiquities, hitherto employed for the traditional tales, songs and sayings, customs and superstitions of the peasantry. On the foundation in 1878 of The Folk-Lore Society, it was adopted and incorporated into the name of the society. But researches and inquiries have compelled a broader view. All the evidence went to show that the traditional customs and institutions, songs, tales, and amusements, beliefs, leechcraft, and so forth of the peasantry in

civilized countries are survivals of an indefinite past, and for the most part bear the impress of a far ruder age; they present innumerable analogies to those of modern savages; resemble them in the one essential feature that they are traditional; and may reasonably be supposed to be ultimately derived from a social condition represented by many tribes which are still living in a low state of culture.

Accordingly in the second edition of *The Handbook of Folk Lore*, issued by the society in 1914, the definition adopted for the term folklore was "the generic term under which the traditional beliefs, customs, stories, songs and sayings current among backward peoples, or retained by the uncultured classes of more advanced peoples, are comprehended and included." The same term is used for the scientific study of these objects; and folklore as a science may be more succinctly and exactly defined as the study of tradition.

To quote the handbook again: "Folklore is the expression of the psychology of early man, whether in the fields of philosophy, religion, science and medicine, in social organization and ceremonial, or in the more strictly intellectual regions of history, poetry, and other



Folkestone. The cliff-top promenade known as the Leas, a feature of this Kent resort and port.

Photo, Lambert Weston, Folkestone

literature." It thus embraces the whole outlook of uncultured man upon the world, his beliefs concerning his own nature and destiny, his relation to other beings, whether objective or imaginary, whether human or non-human, the rites and customs which are the outcome of his beliefs and the expression of these varied relations, and, finally, the amusements of his vacant hours.

The English use of the word *folklore* does not include, as the corresponding German word *Volkskunde* does, the technology of the arts and industries practised either by the unlearned classes of civilized peoples or by the uncivilized or semi-civilized peoples of distant regions. The English student of folklore is concerned rather with the non-technical rules which govern the employment of implements, and with the ceremonies and taboos observed in relation to them, for these reveal the deeper thoughts of the community and the direction of its mental and spiritual life.

#### Old Devonshire Customs

Folklore may be said to be the deposit left by successive waves of culture on the minds of the community. The record is usually far too fragmentary to present anything like a history. What is preserved is that which—whether tale, institution, rite, or custom—has most deeply entered into the popular mentality. At the village of Holne, on Dartmoor, on May-morning before daybreak a ram-lamb used to be hunted down by the young men, fastened to a monolith, killed, and roasted whole. At mid-day a struggle took place for a slice of the animal, which was supposed to confer luck for the ensuing year on the fortunate person who ate it.

At King's Teignton, on Whit-Monday, a lamb is drawn about the parish in a cart covered with garlands. On the following day it is killed and roasted whole in the middle of the village; and slices are sold to the poor at a cheap rate. The custom is said to date back to heathen days, and to owe its origin to a drought, in which the inhabitants prayed for water. Their wants were supplied in answer to the prayer by the bursting forth of a spring, which even now is adequate in a dry summer to work three mills. The sacrifice of the lamb is said to be a votive thank-offering (Sir Laurence Gomme, *Ethnology in Folklore*, 1892).

In these two Devonshire customs it is impossible to avoid recognizing a survival from very ancient times of a sacrificial ceremony. It is a striking and picturesque rite; but from our point of view this is by no means essen-

tial to its preservation. Thousands of traditional observances are of a common-place character, some even disgusting; and it is difficult to say what quality in them caused them to survive. The prohibition, for luck, to put both shoe and stocking on one foot before the stocking is put on the other, has no striking or picturesque features, but the importance it attaches to a trifling detail in the order of dressing indicates that it descends from so remote a past that the original reason seems undiscoverable.

The belief that it is a bad omen if a child do not cry at its baptism, the prohibition in Scotland to give fire out of the house on New Year's Day, and many other precepts and beliefs obviously derive their origin from a much lower stage of culture. Of such survivals it may very often be said, in Sir Arthur Mitchell's words, that "they show the continuance among a people long Christianised of ceremonies and practices emphatically pagan." Where they cannot be said to be "emphatically pagan" they are alien in spirit from modern thought.

From time to time it has been sought to disentangle and classify such survivals, so as to show the ethnic elements of which they are composed. Thus, Sir Laurence Gomme argued that the sacrifice of the lamb in Devonshire was an inheritance from a pre-Aryan society and a pre-Aryan culture. W. H. R. Rivers instituted an elaborate inquiry into the different strata of the institutions and customs obtaining in the Melanesian islands of the South Pacific (*History of Melanesian Society*, 2 vols., 1914). He arrived at some very interesting results, but the questions raised are so complex, the influences are so numerous and varied, and many of them so hypothetical, that it cannot be said that the possibility of assigning the different elements of folklore to their original ethnic source has anywhere yet been demonstrated.

#### Folklore and the Historian

The value of folklore as a record of facts and of the succession of events is much more limited. Ancient historians—for instance, Herodotus—necessarily relied to a great extent on tradition. All through the Middle Ages, and even more recently, it was treated as authoritative. Modern historians have become more sceptical; and the untrustworthiness of oral tradition, in comparison with the more certain evidence of written documents or the statements of eye-witnesses, has been generally regarded as axiomatic.

In the lower zones of culture, however, documentary evidence of events long past is, of course, unobtainable. The evidence of tradition is the only direct evidence possible. In these circumstances some anthropologists have been disposed to rely on it for such matters as the origin and migrations of a people, the pedigree of its chiefs and rulers, the beginnings of its institutions, and the vicissitudes of its history.

#### Subjects of Tradition

Careful examination shows that this reliance is hardly justified. Illiterate persons certainly develop a greater strength of memory than those who habitually depend on books and written memoranda. But both individuals and communities differ widely in this respect: all are not gifted alike. Much depends, also, on the subject. Pedigrees may be remembered because they appeal to the vanity of a family, or because they are important in relation to the descent of property, or the headship of a clan. The interest thus aroused tends to preserve tradition. On the other hand it almost inevitably deforms it. Whether it be material prosperity, or only pride in the doings of ancestors, or the position of a family, what is sure to be insisted on is the glory and advantage of the carriers of the tradition, and the depreciation or the misdoings of their opponents; and where there is no precise record, there is no conclusive answer to their claims. These are, in a sense, private traditions.

Where a tradition is not so closely related to the interest of the individual, or of a close corporation, it is liable to become less definite, the details will be speedily forgotten, and though outstanding facts will continue to be longer remembered, they will remain isolated and unexplained. Ultimately they will pass out of memory, unless an effort to explain and account for them be made. For this explanation the imagination must be drawn on. Without any real historical sense, the story can only be reconstituted as the carriers of the tradition think it ought to have been, in accordance with their ignorance, their mental condition, and their consequent sense of the fitness of things. The result is a mere travesty of the facts, and oftentimes, indeed, is a complete reversal of them.

It might be thought that bare lists of kings or genealogies would be easily remembered by the aid of a fair memory, and would lend themselves but little to freaks of

imagination. In practice this is not so. Apart from the constant occurrence at the head of such lists of eponymous heroes whose former existence is a mere postulate to account for the name of a tribe or clan, a single example of the untrustworthiness of genealogies may be taken from the pedigrees of the chiefs of various sections of the great Thonga tribe in South Africa. It by no means follows that the names given in these pedigrees represent successive steps in the genealogy.

A step may be omitted because in the native mind for this purpose the distinction between a son and a grandson is immaterial. Steps may be duplicated, because a brother may have succeeded a brother in the chieftainship. Or a longer gap may intervene between two names represented as those of father and son. All these errors and others occur in the pedigrees in question, and the native depositories of tradition do not agree among themselves on the subject. The lists do not affect to contain the names of more than eight or ten generations, going back at the most from 200 to 250 years. Yet a Portuguese document dated in 1554 already mentions several of the names, some of which were then probably the names of clans rather than of persons, and two of them are in the document expressly stated to be the names of rivers (Junod, *Life of a South African Tribe*, i, 24-26).

#### A Typical Legend

A legend very widespread in England and other parts of the W. of Europe concerns the position of a church. It asserts that the church, generally a parish church, was intended to be built elsewhere than on its actual site, but that the materials and the building so far as erected were nightly removed by invisible powers, and that the builders were ultimately compelled to accept the site thus supernaturally chosen.

Two examples, both taken from Gloucestershire, will show how tradition may disguise, and in one case entirely reverse, the facts. The story of Bisley church is that it was to have been built in a certain spot definitely pointed out, but the stones were removed at night by the devil to its present site. Actually, the place pointed out as the intended site was the site of a Roman villa, from the ruins of which the materials for the church, or some of them, were obtained. When the church was restored in the 19th century, portions of the villa, including an altar of the Penates, were found embedded in

the walls (Gloucestershire N. & Q., i, 390). Of Churchdown church, a few miles away, on the top of an isolated hill, the tradition recorded is that it was begun "on a more convenient and accessible spot of ground, but that the materials used in the day were constantly taken away at night and carried to the top of the hill, which was considered as a supernatural intimation that the church should be built there."

The fact is that the hill-top was fortified probably from prehistoric times (the rampart is still to be seen), and the original village was there with its church, but that some time before 1170, doubtless in consequence of the greater security of the country, the village—but not the church—was removed down to the side of the hill, and the top subsequently became deserted. The tradition, now comparatively old, could not have originated until the history of the village had been forgotten.

#### Vagueness of Tradition

It may be said in general terms that the exact facts cannot be recovered from tradition after a century, or at most two. Subsequent to that they become vague, confused, and at length fade out of recollection. In France memory hardly goes beyond the Revolution. It is "a sort of chronological landmark, the only one, beside the reigns of some modern sovereigns and the war of 1870, which the people really knows" (Sébillot, *Folklore de France*, 1904-7, iv, 379). All beyond is vague or forgotten. "Before the Revolution" conveys the utmost antiquity.

Some American Indian traditions go back to the events of the 17th century. They are generally presented under more or less romantic guise, and they cannot be depended on. The Wyandots suffered a very great disaster about the years 1648-50: they were massacred, and the tribe was almost totally extinguished by the Iroquois. It might be supposed that so terrible an experience would have been deeply impressed on the minds of the people. So far, however, is this from being the case that "practically nothing seems to have been remembered" (Barbeau, *Huron and Wyandot Mythology*, 1915).

Instances like those cited might be multiplied indefinitely. They render it impossible to rely upon folklore to transmit a knowledge of events. What it does transmit is a record of the mentality of past generations and of earlier stages of civilization. Such a record is transmitted not merely by tale and song and saying, but

also—and perhaps still better—by game, institution, periodical observances, and the more intimate doings and cautions of daily and family life, as well as by the shapes taken by the beliefs in the supernatural and the uncanny. The problem for students of folklore is to unravel them, to compare them with familiar phenomena elsewhere, and to assign to each of them its place and meaning in human evolution. *Consult Handbook of Folk Lore*, C. S. Burne, 2nd ed. 1914; *Introduction to Folklore*, S. J. Brown, 1933.

**Folk-Lore Society.** British society formed with the object of collecting and preserving the relics of folklore. It was founded in 1878, and publishes a quarterly journal, *Folk Lore*, and also occasional volumes and periodical Transactions. It meets at the Royal Anthropological Institute, 21, Bedford Sq., London, W.C.1.

**Folk-moot.** Name given to a moot or meeting of the folk or people. There were moots of various kinds in medieval times, e.g. the shire-moot. Theoretically all freemen could attend, but practically nothing is known of the matter except that among the Teutonic tribes there were meetings of this kind. In England, according to one theory, there was a folk-moot in each of the little kingdoms until these were united and the witan became the dominant assembly. *See Moot; Witenagemot; consult Primitive Folk-moots*, G. L. Gomme, 1880.

**Folk-Song.** Song created by the common people, those whose cultural development has been effected, not by any formal system of training or education, but through the unconscious and intuitive exercise of natural and inborn faculties. Albeit folk-music is the creation of unlettered and technically unskilled musicians, it is not on that account embryonic, i.e. undeveloped or inferior music. The difference between the music of the people and that of cultivated musicians is one of kind, not of degree, akin rather to the difference between the wild and the garden flower—neither of which can be said to be incomplete or imperfect.

Folk-music ordinarily consists of melody only; it is very seldom—e.g. among the peasants of Great Russia—that it has been carried as far as the harmonic stage. Technically, the folk-tune is essentially non-harmonic in construction and implication, being devised by those in whom the harmonic sense is dormant. It is frequently cast in one or other of the diatonic modes more rarely of the chromatic,



and occasionally in the major, but never in the minor mode; and it is free in its rhythm, metrically irregular, often in five-time and other compound measures. Aesthetically, the characteristic of the folk-tune is its transparent sincerity, freshness, spontaneity, naïveté, and directness of statement.

These considerations, coupled with the fact that folk-tunes are invariably anonymous, have led to speculative theories concerning their derivation. Some experts maintain that folk-songs, like other songs, were composed in the past by individuals, and have been handed down more or less incorrectly by oral tradition, i.e. that the folk-song is not a genuine wild flower, but merely a garden escape. Others contend that folk-songs are the creation, not of individuals, but of homogeneous groups or communities; that the process of oral tradition has been responsible, not only for their preservation, but for the course of their development, and, in a sense, for their actual creation; that the alterations unconsciously made by individual singers have at every stage of the evolution of the folk-song been weighed and tested by the community and accepted or rejected by their verdict; and that the life-history of the folk-song has, therefore, been one of continuous growth ever approximating to a form congenial to the taste of the community and expressive of its feelings, aspirations, and ideals.

The weakness of the individualistic theory is that it fails to account not only for the anonymity of the folk-song, but also for its distinctive national flavour, which is, perhaps, the most characteristic and most valuable of its many peculiar qualities. It is because folk-song is pre-eminently a national utterance that its preservation is essential to the musical well-being of the nation of which it is the natural musical expression. No nation has suffered more than England through the failure to realize the necessity of maintaining a close connexion between its folk and its art music, as may be seen by contrasting the foremost position which the country held in musical Europe prior to Purcell, with the humble place to which it has since been relegated.

Fortunately for the future history of English music, the efforts that have been made since the beginning of the century to collect and record its popular music have been attended with a success far greater than, in the circumstances, could have been expected. In this all-important work the

English Folk Song Society, founded in 1898, has played a leading part, having already recorded in its *Journal* several thousand authentic folk-songs. In addition, several selections of harmonised folk-songs have been published by musicians and collectors, e.g. Lucy Broadwood, Ralph Vaughan Williams, George Butterworth, and Cecil Sharp.

Cecil J. Sharp

**Follen, KARL** (1795-1840). German poet. Born at Ramrod, Hesse, Sept. 5, 1795, he was son of a lawyer. He was educated at the university of Giessen and became a teacher of law, but his revolutionary ideas made it necessary for him to betake himself to Switzerland and then to the U.S.A. He became a professor of German at Harvard and later a Unitarian minister at Lexington. In Jan., 1840, he lost his life when on a burning steamer. He is known by his patriotic songs. His brother, August Ludwig Follen (1794-1855), was also a poet.

**Follicle** (Lat. *folliculus*, little bag). In anatomy, a minute gland or sac such as the hair-follicles of the skin. In botany, a dry dehiscent seed case, consisting of one carpel, which opens along the ventral suture.

**Follies, THE**. Pierrot troupe which achieved popularity in London, especially at the Apollo Theatre, and to a limited extent in the provinces, between 1907 and 1912. The Follies owed their success largely to the personality of H. G. Pélissier (d. 1913), who was their moving spirit and composed for them such songs as *My Moon*, and *The Toothbrush and the Sponge*, as well as writing sketches. Potted Plays, a series of burlesques of contemporary productions, were a feature.

**Follow-on**. A term used in cricket. When the side which takes its innings second makes a score of 150 or more runs below that of the opponents, it may be required to bat again immediately. Thus the captain of the leading team is relieved of having to decide when to close his second innings had he taken it, and may gain victory without batting again.

**Folly**. Name given generally to a building for which there appears to be no particular use or reason. The term is of twofold origin and derives from both the French word *folie*—meaning a pleasance, a delight, or a whimsical phantasy, and as a rule applied to garden-pavilions, belvederes, or look-out towers—and from a castle built in the Welsh marches by Hubert de

Burgh. He had scarce completed it when, under the terms of a treaty with the Welsh, he was obliged to demolish the fortress. This futility was styled "Hubert's Folly."

A typical instance of what the rustic calls a folly is the Folly Gate of Brookmans Park, near Hatfield, an embattled red-brick structure of imposing design, thought to have been erected by Sir Jeremy Sambrooke in the 18th century. "Roebuck's Folly" in the grounds of Midford Park, near Bath, is said to have been built in 1700 to commemorate the winning of a fortune by the ace of clubs. The Farmers' Folly, a pillar erected at Alnwick in 1816 by the tenants of the duke of Northumberland, to testify to their appreciation of him, was completed by the duke at his own expense. Sham Castle, or "Allen's Folly," overlooking Bath, was built in 1760 by Ralph Allen. The palatial building erected at Font-hill, Wiltshire, by the author of *Vathek*, is sometimes referred to as Beckford's Folly.

**Folquet of Marseilles** (c. 1150-1231). Provençal troubadour. He was the son of a merchant from Genoa settled at Marsillios. His few surviving poems show his amorous and passionate disposition; his verses won him the admiring friendship of distinguished men and gained him a place in Dante's *Paradiso* (Book ix). He became abbot of Le Toronet, Provence, in 1198, and seven years later was made bishop of Toulouse. With Simon de Montfort he fanatically persecuted the Albigenses.

**Fomalhaut** (Arab. *fum al hūt*, mouth of the fish). Star Alpha in the constellation of Piscis Australis, the southern fish. It is a star of the first magnitude, and one of the four ancient royal stars. It can be seen low down towards the south in Great Britain in Sept. *Pron.* Fō-ma-lō.

**Fomentation** (Lat. *fovere*, to warm). Fold of lint or similar material, wrung out in boiling water and applied to relieve pain or inflammation, or to encourage the discharge of pus. It should be covered with jaconette, or oil silk, and cotton wool, in order to retain the heat as long as possible, and should be renewed every 3-4 hours.

**Fomorian** (Goidelic, sea-people, or giants). Legendary name of an early Irish race. They are claimed by some as Gaelic spirits of darkness and the sea, by others as an echo of the Viking age. -Archaeology, however, points to early arrivals of Nordic "giants" from the Hebrides, and of early voyagers from the Mediterranean.

**Fonblanque**, ALBANY (1793-1872). British journalist. Son of a banker of French descent, he was born in London, and educated at Woolwich, intending to adopt a military career. At 20 he gained success as contributor to *The Morning Chronicle* and *The Times*. He succeeded Leigh Hunt as principal leader writer to *The Examiner*, of which journal he was proprietor until 1847. His intellectual radicalism and caustic wit exerted considerable influence in the political field, and in 1837 his articles were republished under the title *England under Seven Administrations*. He died Oct. 13, 1872. A second edition of his leading articles was published in 1874.

**Fond du Lac**. City of Wisconsin, U.S.A., the co. seat of Fond du Lac co. At the head of Lake Winnebago, 59 m. N.N.W. of Milwaukee, it is served by several rlys. It contains rly. repair shops, and is a shipping point for dairy and agricultural products and lumber. Manufactures include machinery, wagons, refrigerators, furniture, leather, and shirts. A Capuchin monastery is near by. Settled about 1836, it received a city charter in 1852. Pop. 27,209.

**Fondi** (anc. *Fundi*). City of Italy, in the prov. of Littoria. On the Appian Way, 11 m. N.E. of Terracina, it is enclosed by crumbling walls. Among its buildings are a cathedral, and a Dominican convent in which Thomas Aquinas dwelt. Fundi was a Volscian town of some importance. It came under the sway of the popes in the 8th century, and suffered at the hands of Barbarossa in 1534. Fondi lies in a fertile district, and in ancient times was celebrated for its wine. Pop. 11,378.

**Fonsagrada** (Sp., sacred fountain). Town of Spain, in the prov. of Lugo. It stands on the slopes of the Cantabrian Mts., at an alt. of 3,166 ft., 26 m. N.E. of Lugo. It is a mart for local agricultural produce, and carries on flour-milling and the manufacture of frieze and linen. Pop. 19,219.

**Fonseca**. Gulf or arm of the Pacific Ocean. It penetrates inland to a depth of 40 m. between Honduras, Salvador, and Nicaragua. Two volcanoes—Conchagua and Coseguina—stand on either side of its entrance, which is 21 m. wide. On the small island of Tigre in the gulf is the port of Amapali, a name by which the gulf is sometimes called.

**Fonseca**, MANOEL DEODORO DA (1827-92). First president of Brazil. Born at Alagoas, Brazil,



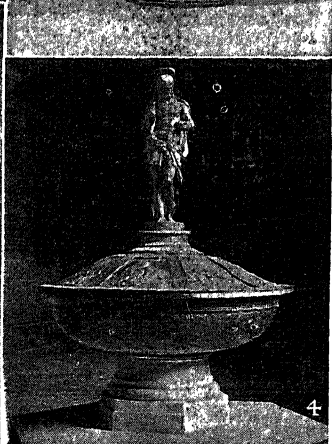
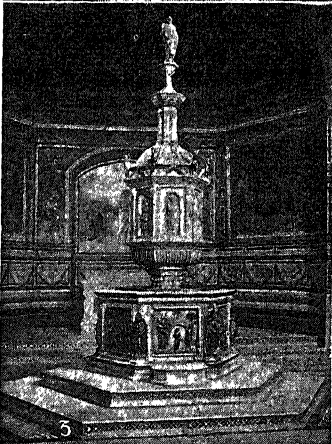
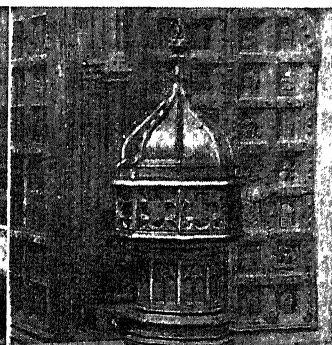
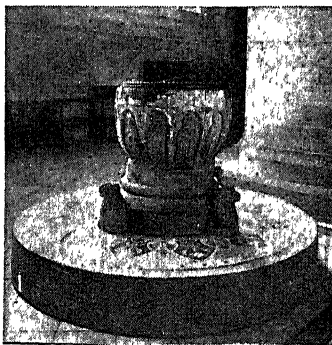
Manoel da Fonseca.  
Brazilian president

Aug. 5, 1827, he joined the army in 1849. He was engaged, 1864-70, in the fighting against Montevideo and Paraguay, and rose to the rank of general. Though sympathetic with the republican party he was a personal friend of the emperor, Dom Pedro, and was, 1886, appointed governor of the province of Rio Grande do Sul. Becoming more closely identified with the republican movement, he was recalled: he headed the insurrection which was followed by the establishment of the republic of Brazil. He was appointed its first president in Feb., 1891, but resigned in Nov. He died on Aug. 23, 1892.

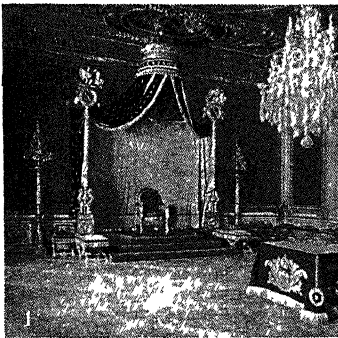
**Font** (Lat. *fons*, stem *font-*, fountain). In eccles. architecture, the basin for the rite of baptism. Constructed of either marble, stone, or lead, it was placed in a part of the church reserved for the pur-

pose, or in a separate baptistery. Since total immersion was customary in the early Christian baptism, fonts were of considerable size. Gothic fonts were often covered by a lid of elaborate construction. The church of Notre Dame at Hal, Belgium, retains a font with a heavy brass cover of this type, which is removable by a crane attached to the wall.

Norman fonts are square or round, with massive pedestals, and are often ornamented with sculptured figures or other decoration; there were few sculptured fonts before this period, the Saxon examples being mostly plain tub-shaped structures made, in the early stages, of wood. A few pre-Norman fonts, however, are rudely sculptured. During the Gothic period fonts followed the line of general architectural development. Thus the pedestals in the 13th century are often made up of clustered shafts. Most of the extant font covers in Great Britain belong to the 17th century, but a few very beautiful covers were added to existing fonts during the



Font. 1. Carved Norman example in Hereford Cathedral. 2. Font in Henry VII's Chapel, Westminster Abbey. 3. Marble font, 1425-32, with bronze figures by Jacopo della Quercia, baptistery of S. Giovanni, Siena. 4. Marble font, 1546, and bronze cover with statue of S. John Baptist by F. Segala, 1585, S. Mark's, Venice.

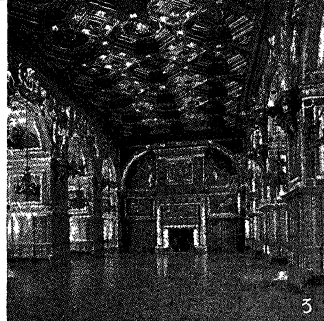
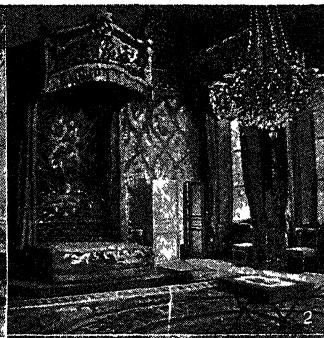


Georgian era. Such is the canopy to the 13th century font at Beverley Minster, which is fashioned in the Renaissance manner with cherub heads and other ornament.

**Fontainebleau.** Town and commune of France, in the dept of Seine-et-Marne. Lying 37 m S.E. of Paris on the Paris-Lyons rly., and about 1½ m. from the left bank of the Seine, it is famed chiefly for its palace and for the forest of Fontainebleau which surrounds it. The town has manufactures of porcelain and gloves paving-stone quarries, and grows a fine type of dessert grapes. A favourite Parisian resort during the summer season, it has an important school of military engineering and artillery. Pop. 15,008

The palace of Fontainebleau was founded probably by Robert II of France about 998, and rebuilt by Louis VII. His building was demolished by Francis I, who built a new palace on the same site, which was in turn expanded and ornamented by almost each successive monarch, and became the favourite dwelling-place of Napoleon I. It was also much altered and decorated by Louis Philippe between 1837-40. It remains one of the finest buildings in France, no less for its internal than its external and garden beauty. There are four principal courts forming the main structure: the Cour du Cheval Blanc, Cour de la Fontaine, Cour Ovale, Cour d'Henri IV. The staircase of Louis XIII, the gallery of Francis I, the banquet hall, and many paintings and tapestries are notable. The palace has seen many historic events, including the signature of the revocation of the edict of Nantes, 1685, and the abdication of Napoleon I, 1814.

The forest, which is a state property, has an area of some 42,500 acres, and a circumference of nearly 57 m. Its beautiful mixed woods, covering broken and often rugged ground, have attracted many artists to the smaller vil-



Fontainebleau. 1. Napoleon's throne. 2. Bedroom of the Empress Josephine. 3. Gallery of Henry II, or ballroom, 16th century. 4. Cour du Cheval Blanc, where Napoleon bade farewell to men of the Old Guard, April 20, 1814

lages in and near them, notably to Barbizon (*q.v.*). It suffered severely from fires in 1895 and 1911

**Fontainebleau Sandstone.** Division of the Oligocene system of rocks developed near Paris. It is notable on account of the remarkable purity of the sands, which are composed almost entirely of water-clear quartz, with high silica-content (over 99.65 p.c.), and of great value in glass-making.

**Fontaine Notre Dame.** Village of France, in the dept. of Nord. It is on the Bapaume-Cambrai road, 2½ m. W. of Cambrai. Captured on Nov. 21, 1917, by the British in the first battle of Cambrai, it was recaptured by the Germans in their counter-attack, and finally regained by the British in Sept., 1918. See Cambrai, Battles of.

**Fontana, DOMENICO** (1543-1607). Italian architect. Born at Mili, Lake Como, he studied at Rome, where he obtained the patronage of Cardinal Montalto (Pope Sixtus V), becoming pontifical architect under him in 1585. His works included the Lateran Palace, the N. transept of S. John Lateran, Rome, and the lantern of the main dome of S. Peter's (according to Michelangelo's design) After Sixtus's death, 1590, he became royal architect at Naples, where he built the Palazzo Reale, and where he died.

**Fontane, THEODOR** (1819-98). German novelist and poet. He was born at Neu Ruppin, Brandenburg, Dec. 30, 1819. He first attracted notice by his romantic ballads; later, as novelist, he was known as an uncompromising realist. Some of Fontane's more notable stories were *Vor dem Sturm*, 1878; *Stine*, 1890; *Der Stechlin*, 1899; and *Cécile*, 1900. Having visited Britain three times, he wrote *Ein Sommer in London*, 1854, and in 1860 two vols. of letters and sketches concerning England and Scotland. He acted as war corre-

spondent in the Slesvig-Holstein campaign and in the Franco-Prussian War. He published his autobiography in 1898, and died at Berlin, Sept. 20, 1898. *Consult* Theodor Fontane: A Critical Study, K. Hayens, 1920.

**Fontanelles** (Fr., little fountains). Soft spaces present in the skull of the infant. The anterior fontanelle, the largest, is a quadrilateral area occupying the place where later the angles of the two frontal and the two parietal, or side, bones of the head will unite. The posterior fontanelle lies between the posterior angles of the parietals and the occipital bone which forms the back part of the skull. The lateral fontanelles, two on each side, are small and irregular in shape. The anterior fontanelle

does not completely ossify until a year or more after birth; the others close shortly before or after birth. The condition of the fontanelles considered with the age of the child affords indication of health and development to the physician.

**Fontanne**, LYNN (b. 1882). An American actress. Born in London, May 16, 1882, she first



Lynn Fontanne,  
American actress

appeared on the stage in a Drury Lane pantomime, 1909. After a visit to the U.S.A., she played in London in popular pieces until 1916, when she joined Laurette Taylor at Rochester, N.Y., in The Wooing of Eve. Settling in New York, she scored a notable success in 1923 in Sweet Nell of Old Drury, opposite Alfred Lunt (q.v.). The following year she married him, and the partnership of "the Lunts" became world-famous. Their acting was remarkable for its precision, sense of timing, and smooth sophistication. Her memorable performances in London were in The Guardsman, 1924 (filmed 1931); Caprice, 1929; Reunion in Vienna, 1934; Amphitryon 38, 1938; There Shall be No Night, 1943; Love in Idleness, 1944 (renamed O Mistress Mine in New York).

**Font de Gaume**. Palaeolithic cave, 165 yds. long, in Dordogne, France. It contains many mural paintings, monochrome and polychrome, of the Magdalenian period, some of them masterpieces of prehistoric art. The bison, horse, reindeer, mammoth, and rhinoceros are depicted, besides a human face and hands, and designs of huts.

**Fontenoy**, BATTLE OF. Fought May 11 (N.S.), 1745, between the British, Dutch, and some Germans on the one side and the French on the other. The Allies' object was to relieve Fontenoy, a fortified village about 5 m. S.E. of Tournai, Belgium, then besieged by the French.

The French under Marshal Saxe were drawn up across the road from Mons along which, coming from the S., the Allies had to advance. Obstacles had been placed in front, while on their right was the Schelde and the fortified village of Antoin; on their left was the wood of Barri. The Allies under the duke of Cumberland arrived before this strong position, on the 10th, and early on the 11th were

ready for battle. Allied attacks were repulsed, the Dutch in the centre failing to take Fontenoy.

After some delay the British and Hanoverian infantry made their advance. Lord Charles Hay of the Guards greeted the enemy with lively taunts, and the two lines opened fire. At closer quarters the fight was continued, and the cavalry were drawn into it. The British and Hanoverians had closed into a square, but after repelling the first attacks they were at length overwhelmed in the general *mêlée*. More French infantry were brought up; the artillery fire became more intense, and, most vital of all, a brigade of Irish bore down upon the Allies. The square was broken, but they withdrew from the field in good order, although they left behind some of their guns. The losses were about equal, something like 7,000 on each side. The British and their allies had about 45,000 men engaged; the French somewhat more. A monument at the village commemorates the Irish brigade.

**Fontevrault** or FONTEVRAUD (Well of S. Evrault). Town of France, in Maine-et-Loire dept. It is on the Vienne, 10 m. S.E. of Saumur. Here, in 1099, Robert d'Arbrissel (1047-1117) founded a great Benedictine abbey and an order after which it was named. The abbey, which at one time housed 300 nuns and 200 monks under the rule of an abbess, existed down to the time of the Revolution. The church, consecrated by Calixtus II in 1119, contains recumbent statues of Henry II of England and his queen Eleanor of Aquitaine, Richard Coeur de Lion, and Isabella of Angoulême, widow of King John. In 1804 the abbey buildings were converted into a prison. In 1910, when the abbey church was restored, the tombs of Henry II of England, his wife Matilda, and his son Richard I were discovered.

**Fonteyn**, MARGOT (b. 1919). A British dancer. Born at Reigate, Surrey, May 18, 1919, Peggy Hookham was educated at Louisville, Ky., and at Shanghai. She studied under Goncharov, Astafieva, and Ursula Moreton, making her début at Sadler's Wells in 1934 in The Haunted Ballroom. The first ballerina produced by the Vic-Wells co., when Markova left that company she inherited many of her leading rôles. Performances in Giselle, Swan Lake, The Sleeping Princess, Les Sylphides, and A Wedding Bouquet showed the extent of her emotional range.

She had instant success in New York in 1949.

**Fonthill** or FONTHILL GIFFARD. Parish and village near Hindon, Wiltshire, England, 13 m. W.N.W. of Salisbury. William Beckford (q.v.), who settled here in 1796, built Fonthill Abbey at a cost of over £250,000, and disposed of it and the greater part of its contents in 1822 for £330,000. A second Fonthill Abbey was built on the same site by the 2nd marquess of Westminster. The church of Holy Trinity, built 1866, replaced that erected by Beckford in 1748.

**Fonvielle**, WILFRID DE (1824-1914). A French aeronaut and author. Born in Paris, July 24, 1824, he early showed a genius for mathematics, and became a teacher. His opposition to Louis Napoleon during the revolution of 1848 caused his banishment to Algeria after the *coup d'état* of 1851, but he returned at the amnesty (1859), engaged in politics, and studied aeronautics. During the siege of Paris, 1870, he made his escape in a balloon, and went to London, where he gave political lectures. He died April 29, 1914.

**Foochow** or MINHOU. Former treaty port of China, capital of the prov. of Fukien. It stands in a plain surrounded by hills on the river Min, 36 m. from its mouth. The town is enclosed by old and crumbling walls, pierced by seven gateways crowned by towers. The suburbs lie outside the walls, and are almost as extensive as the town itself. The river is spanned by the bridge of Ten Thousand Ages, which is a marvellous example of Chinese engineering; it connects with the island of Nan-tai, the European quarter. The bridge is supposed to be over 800 years old.



Margot Fonteyn. British ballerina, the first produced by the Vic-Wells ballet company

There are shipbuilding yards, an arsenal, a dry dock, numerous wharves, and a school of navigation. The leading industries are connected with cotton goods, timber, tea, paper, matches, spices, cereals, and ores, while there is a large trade with the maritime provinces of China.

Foochow was opened to foreign trade in 1842. In 1941 it was captured by the Japanese on April 21 but recaptured by the Chinese on Sept. 3. The invaders took it again on Oct. 8, 1944, after bitter fighting, and the Chinese regained it on May 18, 1945. Pop. 322,725.

women in China ate powdered reindeer horns long before medicine realized that the need for calcium is doubled in pregnancy and lactation. American Indians knew how to cure scurvy by eating pine needles long before Vitamin C was discovered. Science has provided an explanation for much of this traditional empirical knowledge and cleared it of superstition. The principles have been elucidated and stated in exact terms which enable them to be applied with greater certainty.

The science of nutrition which has made such a great advance on traditional knowledge began with Lavoisier, who lived about the time of the French Revolution. His researches proved that the heat needed to maintain body temperature and the energy needed for muscular work were derived from the oxidation of carbon compounds in the body, and that these are supplied by food. He also showed that the amount of oxygen absorbed from the inhaled breath and the amount of  $\text{CO}_2$  given off in the exhaled breath correspond with the total heat and muscular work produced in the body. This discovery of Lavoisier's made it possible to measure the total amount of energy expended by the body under various conditions of external temperature and amount of work done. The next step was to find out how much energy was available in foodstuffs. Liebig, a German chemist who had studied in Paris, took the lead in devising chemical methods for determining the amount of available energy in proteins, fats, and carbohydrates, the three constituents of food which yield energy, and the amount of each in different foods. Biochemistry was developed by the search for such methods of analysis.

#### Calorimeter Experiments

In the 19th century, by experiments with the calorimeter, a knowledge of energy requirements of the body was obtained and the chemists worked out the available energy of different foodstuffs. By the end of the century it was possible to determine the amount of food needed for heat and muscular work under different conditions.

As protein is the main constituent of living tissue, it was considered of special importance. It was thought that while fats and carbohydrates could supply heat, it was from protein that the energy for work was obtained. All three constituents can, in fact, yield energy for heat and consequently

## FOOD AND NUTRITION

Lord Boyd-Orr, Director-General, United Nations' Food and Agriculture Organization, 1945-48

*Food and its constituents, their effect on human health and energy, the minimum requirements of the average man: these are some of the facts here explained by one of the world's greatest food experts. See Food Control; Food Preservation; also Fisheries; Flour; Fruit, etc.*

Food is the term applied to substances eaten to sustain life. Nutrition deals with the chemical composition of foodstuffs, the function of their constituents and their adaptation for maintaining health.

The main activities of undomesticated animals are absorbed in the struggle for food. The same is true of man. It is only within comparatively recent times that as many as 15 or 20 p.c. of the world's population have had a reasonable assurance of sufficient food for health. The fight for food has been the main cause for migration of people and the driving force among the masses in great political movements when migration no longer offered prospects of more food. That was true of the French Revolution and also of the Chartist movement in England. After the Napoleonic war the price of bread was so high in proportion to wages that the children of the working classes in the industrial areas had to earn their bread or starve.

#### Need for Production

The struggle for food still exists. The land hunger of peasants in eastern Europe and elsewhere is due not so much to a desire to be landlords as to a desire for freedom to retain for their own needs sufficient of what they produce. In Asia lack of food may be the great world political problem of the 20th Century. The population is already more than the land, with primitive methods of cultivation, can support, and it is estimated that by 1970 it will have increased by 400 million, equal to the population of Europe. There will be an explosion of the population unless agriculture and industry are developed to increase home production and imports of food.

A century and a half ago Malthus predicted that growth of the world population would outrun its capacity to produce food. Recently students of population

changes have expressed the same fear. It is estimated, however, that with the scientific knowledge available it would be possible to produce sufficient food for three times the present population of the world. The only absolute limit to food production is the amount of solar energy the earth receives. Only an infinitely small percentage of that is transformed into the food people eat. Where anything grows, food can be produced. The only practical limit to food production is the amount of labour mankind is prepared to devote to it, and the willingness of governments to cooperate in plans on a world scale to apply science to develop the natural resources of the world.

#### Food to Maintain Health

The preoccupation with food has developed an instinct which guides both men and animals in the selection of the kind of food needed to maintain health. Where the foods available are deficient in some essential ingredient, this instinct drives animals to seek what is deficient. Cattle grazing on pasture deficient in certain mineral elements eat earth rich in what is lacking. They make long treks periodically to the "salt licks." Pigs kept in confinement on food deficient in lime dig out the lime between the bricks of the pens. This craving for what is deficient in food is called "pica." Human beings show the same instinct. Food taboos and customs among native tribes, which appear irrational to Europeans, in most cases originated from observations of cause and effect. Many of these curious customs foreshadowed discoveries in nutritional science. It has recently been discovered that endemic goitre is associated with a lack of iodine. The Greeks knew that eating sponges and seaweed, which are now known to be rich in iodine, prevented goitre. Pregnant

for work, and in calculating food requirements they are interchangeable in isodynamic, *i.e.* equal energy-yielding, proportions.

In the beginning of the present century it was assumed that if the diet yielded sufficient calories for heat and energy and contained sufficient protein for growth and replacement of used-up tissues, the needs of the body for food would be met. Diets were therefore calculated in terms of calories and protein, and research on the physiology of nutrition was confined largely to studies of energy exchange and protein metabolism. Dietetics was based on physics and chemistry, which indeed are the logical outcome of the investigations of Lavoisier. His researches were not on the nutrition of the body. They were on the nature of heat and energy. He believed that the body obeyed the same laws of thermodynamics as a machine and used it to demonstrate the principles which replaced the old idea of phlogiston (*q.v.*).

#### Discovery of Vitamins

In the beginning of the present century the physics and chemistry of dietetics began to be supplemented by biological tests. This new line of investigation showed that foodstuffs in their natural condition contained substances now called vitamins which are as important for maintaining life as calories or proteins. It was also found that mineral elements were of greater importance than had been thought. Many commonly occurring diseases, the cause of which had long been a mystery, were found to be due to a deficiency of vitamins or of minerals in the diet. This discovery of the vitamins and the new appreciation of the profound effect of food on health led to a great expansion of research on nutrition to determine the chemical composition of vitamins, how much of each is needed to maintain health, and the amount of vitamins contained in different foodstuffs. In addition to calories and proteins food requirements are now stated in terms of a dozen or more vitamins and minerals.

The constituents of food are usually considered as falling within the following groups: carbohydrates, fats, proteins, minerals, vitamins, and water.

**Carbohydrates** contain only the three elements carbon, hydrogen, and oxygen, the two latter always in the same proportion as in water,  $H_2O$ . There are three kinds of carbohydrates — namely, sugars,

starches, and celluloses. Examples of sugars are glucose  $C_6H_{12}O_6$ , which occurs in fruit juices and also in the blood, and sucrose  $C_{12}H_{22}O_{11}$ , which is found in beet and in sugar cane. Plants such as wheat, rice, and potatoes store their food reserves in the form of starch, and this provides the main part of our carbohydrate supply. Glycogen, or animal starch, is formed from glucose in the liver and muscles of living animals and acts as a reserve store of energy. Cellulose forms the fibrous parts of cereals, fruits, and vegetables. It is not digested by man, but it helps to stimulate the muscles of the intestine.

**Fats** contain the same three elements as do carbohydrates but the proportion of oxygen is much lower. They consist almost entirely of the glyceryl esters of various fatty acids, of which the most commonly occurring are stearic, palmitic, and oleic acids. They contain also what is termed chemically "unsaponifiable matter," which though it constitutes only 1 to 2 per cent of the fat itself, is nevertheless of great nutritional importance, since any vitamins which the fat contains are in this fraction. Fats are present in considerable amounts in animal tissues, and they occur also in many seeds such as cottonseed and linseed. As a source of energy, fat is the most concentrated of all foods.

**Proteins** are essential constituents of all plant and animal cells. They are highly complex compounds of amino acids, more than 20 of which are known to the chemist. The composition and the characteristics of a protein vary according to the nature and the proportion of the amino acids it contains. All the proteins contain nitrogen in addition to carbon, hydrogen, and oxygen, many contain sulphur as well, and some contain phosphorus. While plants can manufacture proteins from inorganic materials (derived from the soil and from the air), animals cannot do this, and must have provided in their diet readymade proteins of plant or animal origin from which they can obtain the amino acids essential for building up their own body tissues. Plant proteins differ from animal proteins both in the number and the proportion of their constituent amino acids. Generally speaking, animal proteins are superior nutritionally to plant proteins, and it is customary to refer to the former as good or first-class proteins, and

the latter as poor or second-class proteins. One protein will, however, supplement another, so that a mixture of animal and plant proteins is biologically more valuable than is either class taken alone.

**Mineral constituents.** In addition to proteins, fats, and carbohydrates, foodstuffs contain various mineral or inorganic constituents. The following are known to be essential for normal nutrition, since they are required for structural purposes and for the physiological functioning of the body: calcium, phosphorus, magnesium, sodium, potassium, chlorine, iron, copper, iodine, and manganese. Many of these mineral constituents are needed only in minute quantities, but they are nevertheless very important for the maintenance of physical well-being.

**Vitamins** are chemical substances present in foodstuffs in very small amounts which are necessary for health but which, with one exception, *viz.* Vitamin D, the human body cannot manufacture for itself. That certain unknown substances were essential for the maintenance of health in addition to the "classical" nutrients, protein, fat, carbohydrates, and minerals, had long been suspected. It was only in the second decade of the present century, however, that their existence was definitely established. As their composition was unknown they were designated by the letters of the alphabet, Vitamins A, B, C, etc. Originally Vitamin B was considered to be a single entity, but it is now known that several different substances are contained in the original Vitamin B. These include Vitamin  $B_1$ , riboflavin, nicotinic acid, and pyridoxin. The chemical structure and properties of many vitamins have now been determined, and it is therefore customary to refer to them as specific substances, *e.g.* Vitamin C as ascorbic acid, Vitamin  $B_1$  as aneurin, etc.

#### Classes of Nutrients

Foodstuffs in their natural state contain these classes of nutrients, together with water, in varying proportions. Animal products, *e.g.* meat, fish, milk, and eggs, are rich in protein and fat, while plant products such as cereals are richer in carbohydrate than in protein. Animal foods contain the fat-soluble Vitamins A and D, while fruits and vegetables contain the water-soluble Vitamin C and Vitamin A, in the form of carotene. Cereals are rich in the B vitamins.



NUTRITIVE VALUE OF 100 gm. OF SELECTED FOODSTUFFS (EDIBLE PORTION)\*

Foodstuff	Water (p.c.)	Food energy (calories)	Protein (gm.)	Fat (gm.)	Carbo- hydrate (gm.)	Cal- cium (mg.)	Phos- phorus (mg.)	Iron (mg.)	Vitamin A (I.U.)‡	Vitamin B (mg.)	Vitamin C (mg.)
Beef .. ..	67	193	18.9	13	0	11	204	2.8	0	0.12	0
Eggs .. ..	74	158	12.8	11.5	0.7	54	210	2.7	1140	0.12	0
Milk .. ..	87	69	8.5	3.9	4.9	118	93	0.07	180	0.04	1
Cheese .. ..	39	393	23.9	32.3	1.7	873	610	0.57	1740	0.04	0
Granulated sugar ..	0.5	398	0	0	99.5	0	0	0.1	0	0	0
Whole wheat flour ..	11	380	13	2	72.4	38	385	3.8	0	0.56	0
70 p.c. extraction flour	13	350	13.1	1.2	71.6	13	100	1.8	0	0.69	0
Potatoes .. ..	77.8	85	2	0.1	19.1	11	56	0.7	0	0.11	17
Cabbage .. ..	92.4	29	1.4	0.2	5.3	46	31	0.5	800†	0.07	52
Carrots .. ..	88.2	45	1.2	0.3	9.3	39	37	0.8	9000†	0.07	6
Oranges .. ..	87.2	50	0.9	0.2	11.2	33	23	0.4	190	0.08	49

\* Figures derived from Tables of Food Composition, U.S. Department of Agriculture, Miscellaneous Publications, No. 572, 1945, and Nutritive Value of War-time Foods, Medical Research Council Memo, No. 14, 1945.

† Present as carotene, and determined biologically.

‡ International units

The table above shows the average composition of some representative foodstuffs.

**DIGESTION.** This is the process of breaking down food into soluble constituents which can be absorbed from the alimentary canal, and is done by ferments or enzymes which are present in juices secreted by glands in the lining of the canal, and in pancreatic juice and bile secreted by the pancreas and the liver, respectively. The pancreatic juice and bile pass into the duodenum by special ducts. The enzymes act as catalytic agents, accelerating the breakdown of the ingested food material, while themselves remaining relatively unchanged. Each enzyme has a specific action affecting only one type of compound, *e.g.* pepsin acts only on protein, lipase only on fat, and amylase on starch.

#### Process of Digestion

The process of digestion begins in the mouth, where the food is broken up by chewing and mixed with the saliva, which is secreted by glands in the mouth. The saliva is slightly alkaline and contains an enzyme (maltase) which breaks down some of the starch in the food into sugar. After mastication the bolus of food is collected on the tongue, which pushes it back into the oesophagus or gullet, while the soft palate is lifted to cut off the passage to the trachea or windpipe. The food passes from the oesophagus to the stomach which acts as a reservoir. Contractions of the muscular wall of the stomach ensure further mixing and mechanical disintegration of the food, which at the same time is mixed with gastric juice secreted by the stomach. This juice contains 0.2 to 0.4 p.c. of hydrochloric acid, and also the enzyme pepsin, which is responsible for the partial breakdown of proteins.

The contractions of the stomach wall pass the food forward to the small intestine and duodenum

through the pyloric valve, a muscular ring at the junction of the stomach and intestine. This valve relaxes from time to time to allow the passage of part of the stomach contents. In the small intestine, rhythmic movements of the walls churn up the food and mix them with the digestive juices, which include pancreatic juice and bile. Further digestion then takes place as the result of the action of enzymes present in these juices. Thus starch is broken down by amylase to glucose, the proteins, already partially digested in the stomach, are split into still simpler compounds by trypsin, and fat, by the action of lipase from the pancreatic juice together with bile, is emulsified and broken down into soluble constituents which can be absorbed into the blood.

Absorption of the digested nutrients takes place mainly through the mucous membrane of the small intestine. The rhythmic movements of the intestine force the unabsorbed food material, and the waste matter excreted from the blood into the gut, into the large intestine. Here water is absorbed by the walls of the gut and the partially dehydrated material passes to the rectum, from which it is excreted from the body through the anus as faeces.

#### Mental Effects on Digestion

The digestive processes are involuntary, but they are affected by the mind. The smell or even the thought of food can produce appetite and cause an outpouring of saliva "making the mouth water." Moreover, the movements of the intestine are affected adversely by emotions of fear, worry, and anger.

**METABOLISM.** In every active living cell a continuous cycle of chemical changes is going on, compounds being built up and broken down, energy being liberated and waste material excreted into the surrounding fluid. These changes are termed metabolism. They de-

pend on the food constituents absorbed from the gut. When these pass into the blood stream soluble carbohydrates (in the form of glucose) and fat may be carried direct to the tissues to be oxidised to yield energy. If, however, there is already sufficient in the blood to meet immediate needs the glucose is converted to glycogen and stored in the liver and muscles, while the fat is stored as such in the fatty and muscular tissue. These stores can be mobilised as sources of energy when required.

#### Surplus Amino Acids

The amino acids are linked in certain proportions and combinations to form the characteristic proteins of the body. As the composition of the proteins in the food is different from that in the body proteins, many amino acids are surplus. The nitrogen of these is split off and converted to urea in the liver and carried by the blood to the kidneys to be excreted in the urine. The remaining part is oxidised in the same way as the carbohydrates or fats to yield energy for work or heat. Minerals in excess of requirement are excreted in the urine or the faeces.

While the effect of a deficiency of one or other of the vitamins is well known, the rôle that they play in the metabolism of the body is not yet fully understood.

**FUNCTIONS OF FOOD.** From food the body derives energy for maintenance of body temperature, muscular work, etc., and constructive material for growth and replacement of wastage of the tissues. Fats and carbohydrates are the chief sources of energy, while protein is the source of material for growth and repair of the soft tissues. Protein in excess of these requirements can, however, be used for the purpose of producing energy.

Of the minerals present in food, calcium and phosphorus are required in large amount, since

they are necessary for the formation of the teeth and the skeleton. Sodium, potassium, and chlorine function in the body in various ways, e.g. by maintaining the osmotic pressure of the body fluids, the acidity or alkalinity of the various digestive juices, and so on. Iron is an essential constituent of haemoglobin, the red pigment of the blood. Traces of copper also are necessary for the formation of this pigment. Iodine is required for the secretion of the thyroid, though only in small amounts, but if these are not available, a serious disturbance of the metabolism occurs. Other minerals, such as manganese, are required in minute quantities and the exact rôle which they play in the body is as yet obscure, but that they are of vital importance is shown by the fact that where they are absent from the diet, the metabolism becomes abnormal and signs of malnutrition appear. As in the case of the enzymes, each of the vitamins has specific functions to perform. When the diet, although adequate in other respects, is lacking in any particular vitamin, the specific functions are not performed, and a disorder, characteristic of this vitamin deficiency, is produced.

#### Vitamins A, B, C, and D

It is known that an adequate supply of Vitamin A is associated with the capacity of the mucous membranes to resist local infections and with the maintenance of a healthy skin. It is also necessary for the formation of the visual purple of the retina, which is required for seeing in a dim light. This vitamin occurs in foods either as the preformed vitamin, or as its precursor carotene, an orange-red pigment which can be converted by the human liver into Vitamin A. This pigment is found in green vegetables, and is particularly abundant in carrots. Vitamin B<sub>1</sub> is concerned with carbohydrate metabolism. In its absence the disease beri-beri occurs, which is characterised by lesions of the nervous system, the cells of which depend on carbohydrate for their energy supply. When the carbohydrate metabolism becomes abnormal as the result of vitamin B<sub>1</sub> deficiency, pathological changes take place in the nerve cells. Vitamin C is essential for the formation of bones and cartilage and for the proper healing of wounds. A deficiency of Vitamin C results in scurvy, a disease

in which there is weakness and pain in the limbs, swelling and bleeding of the gums, and loosening of the teeth. Vitamin D is indispensable for the laying down of calcium and phosphorus in the bones and teeth. When this vitamin is not available either because it is absent from the food or because the body is at the same time deprived of sunlight (which enables it to manufacture its own Vitamin D), rickets develop. In this disease, to which children in particular are subject, the bones, owing to lack of proper calcification, readily become deformed. Such deformities may persist into adult life, with, in some cases, serious consequences to the individual.

DIETETICS might be defined as the practical application of the science of nutrition. It deals with the amounts of each food constituent required for health by males and females of different ages and varying activities. The first estimates of food requirements were made by ascertaining what people actually ate. As the science of nutrition developed, requirements were arrived at by experiments in which men were placed in enclosed chambers known as respiration calorimeters. In these experiments the intake of food and oxygen was determined and the energy expenditure of the body, either active or at rest, was measured in terms of the heat produced. Similar information can be obtained by an indirect method, in which the amount of oxygen breathed in and the amount of carbon dioxide breathed out during a given period is determined. By such experimental methods sufficient data have been obtained to estimate with some degree of accuracy the amount of potential energy which must be supplied in the food to meet the requirements of the body for heat and muscular work.

#### The Calorie as the Unit of Energy

The unit used in measuring the potential energy of foods is the calorie, which is the amount of heat required to raise 1,000 gm. of water 1° C. We know from experimental data the amount of heat given out by the different classes of foodstuffs when they are burned. One gram of protein and 1 gm. of carbohydrate each yield approximately 4.1 calories, while 1 gm. of fat yields 9.3 calories. Since the proportions of these constituents in the various foodstuffs are known, the energy

value of a food can readily be calculated. It is evident that foods containing much fat will have a high calorie value, while succulent foods, such as fruit and green vegetables, will supply very little energy.

#### Variation in Calorie Requirements

The calorie requirement of men is as a rule greater than that of women, but the requirement of individuals is dependent on the amount of muscular work which they perform. The following table shows the variation in calorie requirements of men engaged in different types of employment.

<i>Calories per day</i>	
Very heavy work (coal miners, lumbermen)	4,000-6,000
Heavy work (stonemasons, dock workers)	3,500-4,000
Moderately heavy work (carpenters, shoemakers)	3,000-3,500
Sedentary work (clerks, tailors)	2,000-2,500

Though the requirements for various other nutrients cannot yet be estimated with any great degree of accuracy, it is possible from the available evidence to state what amounts of the essential food constituents should be included in practical diets to maintain well-being.

ECONOMICS OF FOOD. In the 19th century the food problem in Europe was one of finding sufficient food to satisfy hunger. In England in the early 19th century, the price of a 4-lb. loaf rose as high as 1s. 6d., and wages were very low. After the repeal of the Corn Laws in 1846, cheap wheat came in from the virgin lands of N. America. By the end of the century the price of a 4-lb. loaf was 5d., and wages were almost double what they had been in the early part of the century.

Almost all the working class could obtain sufficient bread and it was thought that the political and economic problem of food was solved. But the discovery of vitamins led to investigations into the adequacy of diets for health. It was found that even in the wealthiest countries, such as the U.S.A. and the U.K., nearly one-third of the population did not enjoy a diet on the health standard. This was due to the fact that foodstuffs rich in proteins, vitamins, and minerals are more expensive than those which are poor in these constituents. Consequently the lower the family income the greater is the proportion of these cheap and less nourishing foods in the diet.

The following list, compiled by G. Morgenstern, shows the cost in pence of 1,000 calories of some common foods in Jan., 1946.

Bread .. .. .	2.0
Margarine .. ..	2.1
Sugar .. .. .	2.3
Potatoes .. .. .	4.1
Butter .. .. .	5.9
Cheese .. .. .	7.0
Beef .. .. .	9.6
Milk (fresh) .. .	12.9
Eggs (fresh) .. .	25.5
Vegetables and fruit ..	40-100

After the world economic crisis of 1929-33, which led to large-scale unemployment with resulting decrease in purchasing power of the working classes, the price of foodstuffs fell below the cost of production, bringing ruin to farmers. In Europe and in N. America, government measures were introduced in an attempt to restrict production and imports in order to raise prices. But at the same time it was known that more than half the world's population suffered ill health due to lack of sufficient food. At the League of Nations assembly in 1935, proposals were put forward for a plan for the "marriage of health and agriculture," i.e. to increase consumption among the badly fed people of the world and so provide a market for all the foodstuffs produced. An international committee of economic, agricultural, and nutrition experts was set up to investigate the food and agricultural problems. This committee made certain recommendations, including the setting up of national committees by each of the governments adhering to the League to investigate the food position. A meeting of representatives of the committees of 20 governments was held in 1938. The outbreak of war in 1939 brought this movement to a close. In 1943, President Roosevelt invited the United Nations to send representatives to a conference at Hot Springs to consider what measures should be taken to bring about freedom from want of food to all men in all lands. A report of the committee led to the setting up of the Food and Agriculture Organization (*q.v.*) of the United Nations.

#### Wartime Fall in Production

During the Second Great War, owing to the fall in food production on the continent of Europe and in certain parts of Asia, and also to difficulty in transport, there was a shortage of food in many countries. The shortage became more acute after the war finished, owing largely to the disastrous

world harvests of 1945. This post-war food crisis in the war-devastated countries was dealt with by Unrra (*q.v.*) and later by the International Food Council set up in 1946 by the Food and Agriculture Organization.

War has always been accompanied by an increased demand for food and followed, as after the First Great War, by decreased demands and a resulting fall in price. Other factors such as good and bad harvests, level of unemployment, etc., also affect prices. In nine of the ten years between 1928 and 1938 the price of wheat in the world market fluctuated by over 70 p.c. This fluctuation in price is the bane of agricultural producers. In recent years several governments have attempted to stabilise prices. But the food and agriculture problem is interlocked with industry, trade, and international finance, and cannot be solved by measures dealing only with food and/or agriculture. The provision of a food and health standard depends as much upon the industrialisation of undeveloped countries, where hunger and malnutrition exist, as upon the development of agriculture. The economic problems of food production and consumption must be studied in the light of these wider issues.

**Food, INSPECTION OF.** Government service in Great Britain, the U.S.A., and other countries maintained to ensure that food supplied to the public reaches defined standards of composition, purity, and soundness. An Act to make the adulteration of bread illegal was passed in Great Britain in 1836, since when a number of Acts dealing either with particular commodities or with food as a whole, as well as sections of general Public Health Acts, have made more stringent the regulations governing the sale of foodstuffs, and extended the powers and duties of authorised inspectors to see that the regulations are carried out.

These various enactments were consolidated in the Food and Drugs Act of 1938 which brought under one comprehensive act all aspects of food and drug inspection, including the treatment of unsound food, precautions to be taken against food poisoning, purity of milk, hygienic condition of dairies, markets and slaughter houses, cold stores, etc. The Ministry of Health is the responsible authority, the minister having power to make and necessary regulations.

In all counties and in the larger towns there are food and drug inspectors, who are sometimes also sanitary inspectors and inspectors of weights and measures. All county councils must, and large towns may, appoint a duly qualified public analyst who must be a highly skilled chemist holding special diplomas such as the fellowship of the Royal Institute of Chemistry in this branch. The inspectors have statutory powers to take samples which they submit to the public analyst, who examines them and issues an appropriate certificate showing whether or not the sample is satisfactory. If it is not, then legal proceedings may be taken against the vendor, the manufacturer, or the distributor according to the circumstances. Other duties of the inspectors include the examination of meat, of slaughter houses, meat markets, etc.; this branch calls for possession of a special diploma. All local authorities have a medical officer of health who is concerned with some aspects of food inspection and may impound food which he has reason to think is likely to cause poisoning.

#### Inspecting Food from Abroad

Under the Food and Drugs Act, port authorities, customs and excise officers, and medical officers of health for the port have to supervise food arriving in Great Britain. Such food is inspected, sampled, and analysed, or examined bacteriologically. In dealing with food, port officials combine three distinct functions: the exclusion of diseased or unsound food, the collection of customs dues on dutiable foods or constituents, and the enforcement of regulations as to composition or purity.

Most civilized countries have pure food laws and systems of inspection much on the same lines as those in Great Britain. In the U.S.A. a Federal Food and Drugs Law has superseded many of the individual state laws; that country has a very thorough system of meat inspection. In the Netherlands and in Switzerland the examination of milk and dairy products is particularly effective, being accomplished largely by regional laboratories so situated that it is possible to bring in all samples quickly—a matter of importance in controlling the bacteriological condition of milk supplies. France has very well developed inspection of meat and slaughter houses, and very numerous detailed regulations for particular foods and wines. Some food exporting countries

inspect food for export carefully, e.g. meat in New Zealand, fruit in South Africa, in order to ensure that food sent abroad attains a required minimum standard.

**H. E. Cox, Ph.D., D.Sc., F.R.I.C.**

**Food, MINISTRY OF.** British government department responsible for controlling and distributing the nation's food. During the First Great War no attempt was made to control food consumption until Dec., 1916, when a food controller was appointed; the main energies of his department were at first devoted to exhortation. The success of the U-boat campaign necessitated sterner measures. Lord Rhondda took office as food controller in the following June. District food offices closed at the end of 1920, the ministry of Food in March, 1921.

A new ministry of Food was formed on Sept. 8, 1939, out of a department which had been operating since 1936. The first minister was W. S. Morrison; Lord Woolton's administration, April 3, 1940, until Nov., 1943, placed the ministry on a sound basis.

The ministry, whose powers were derived from the defence regulations, operated, wherever possible, with or through existing traders, but maintained a network of local offices. Its functions were to ensure adequate supplies of foodstuffs, distribute them equitably, and control prices. In addition to the purchasing and distribution of foods for the general public, the ministry's work included the administration of a welfare food service to expectant mothers and children under 5; regulation of food standards and labelling; and advice to help consumers make the best use of available supplies. *See* Food Control; Rationing.

**Food and Agriculture Organization.** Name of a subsidiary body of the United Nations. Based on plans drawn up at the Hot Springs Conference (q.v.) of 1943 on world food supplies and distribution, it was inaugurated at Quebec, Oct., 1945, 42 nations participating, and was the first of the permanent international organizations within the framework of the United Nations to come into existence. The Soviet Union, the Ukraine, White Russia, and Argentina, though represented by observers at the conference, decided not to participate in the organization. Its objects were to procure and coordinate information about agriculture and available food supplies in all member countries, to assist in the fair

distribution of such supplies, and, ultimately, to advise on crops needed, agricultural methods, etc., with a view to securing the best possible standard of nutrition for all the peoples of the world. Sir John Boyd Orr (Lord Boyd-Orr), British expert on nutrition, professor of agriculture at Aberdeen university, was on Oct. 27, 1945, unanimously elected first director-general. The F.A.O.'s second full session, at Copenhagen in Sept., 1946, attended by delegates from 33 of the 42 member nations, set up a committee to study plans for the creation of a world food board (q.v.).

**Food and Drugs Act.** Title of several enactments of the British house of commons passed to ensure the maintenance of a prescribed standard of purity, composition, and soundness of food and drugs offered for sale in Great Britain. Earlier legislation of this kind was consolidated in the Food and Drugs Act of 1938. *See* Food, Inspection of.

**Food Chains.** A term used in ecology. Animals eat plants; plants, using the energy of the sunlight, produce food from dead substances. This fundamental difference between plants and animals is the fact round which are built not only the relations between plants and animals, but also between many groups of animals. One kind of animal may, instead of eating plants directly, interpose another kind of animal between itself and the plant. A man eats a sheep which has eaten grass; the relation man-sheep-grass is then a food chain three links long. In the sea extremely long and complicated chains and indeed networks develop involving numbers of kinds of animals.

**Food Control.** Organization of supplies and equitable distribution of essential foods. Food control as currently understood was a product of the First Great War. The Allied blockade forced the German and Austrian governments to organize collection from producers and control distribution, while in Great Britain the loss of E. European supplies and the submarine campaign made it vital to plan imports. Lord Devonport, appointed food controller at Christmas, 1916, was succeeded in the following June by Lord Rhondda. The principles on which he worked were: (1) securing essential bulk supplies, if necessary by government purchasing, e.g. of meat and dairy produce from the dominions; (2)

giving priority of tonnage for essential foods; (3) fixing maximum prices at each stage of selling; (4) eliminating speculators. Given control of supplies and prices at the source, distribution could be left to traders, licensed, and sometimes specifically organized, for the purpose.

#### Control of Supplies and Prices

During the Second Great War nearly every country in the world was forced to adopt some measure of control based on bulk supplies, maximum prices, and a more or less flexible system of rationing. Food control in the U.K., although not complete, for bread and potatoes remained unrationed, was generally considered one of the best worked out and enforced. Thanks to the work of the Food (Defence) Plans department, established in 1936, the machinery was ready to be set in motion when war broke out. When supplies from the Far East had been cut off and shipping lanes lay exposed to attack from Europe, supplies, distribution, prices, and consumption had to be subjected to controls of severity never contemplated before the war.

**Production.** Domestic agriculture was required to yield the maximum for direct human consumption while replacing as far as possible the feeding stuffs, fruit, eggs, etc., which virtually ceased to be imported owing to limited shipping space. County war agricultural executive committees were set up. By price inducements and direct controls, the arable acreage was increased by half, the potato acreage doubled, wheat output trebled, and vegetable production on farms and allotments increased many times. Farmers were encouraged to become self-sufficient in feeding stuffs. Nevertheless, serious reductions occurred in livestock populations, and it was decided that dairy cows should have first claim on available feeding-stuffs. Milk and millable grains were reserved for direct human consumption, and sheep and poultry populations declined by a quarter and the pig population by more than half.

**Imports.** The government took control of imports of staple foods and of all food stocks in the country and in British hands abroad. Control was virtually complete in March, 1940. For all chief foods the ministry of Food became the sole importer. Bulk purchases were made from overseas exporters; exportable surpluses were sometimes purchased in advance.

especially from the colonies. Food missions were established in several countries, while as a member of the Combined Food board, the U.K. helped to plan the allocation of world supplies of scarce foods, itself buying on behalf of the board in certain markets. It was possible to supplement home production with foods economical in shipping space, *e.g.* livestock products, and dried goods.

**DISTRIBUTION.** The government aimed at securing maximum supplies for its controlled channels of distribution, and price structures and marketing systems were devised to this end. Eggs were bought from poultry keepers by licensed packing stations at a higher price than could legally be charged for a retail sale. Farm to farm sale of all grain was prohibited. Fat stock, sheep, and pigs could be sold only to the ministry, while apart from direct off-farm sales, all milk passed via the Milk Marketing board to the ministry. For all important foods, channels of trade were laid down and the ministry assured control by licensing pre-war traders.

#### **Allocating Raw Materials**

Various methods were used for controlling supplies, transport, and nutritional standards in the food-processing industries. Flour was never state owned although control of the mills fell little short of state management. Sometimes the government owned both the raw materials and the finished products; or it managed the plant direct, as in vegetable dehydration factories. In allocating scarce raw materials like sugar, oils, and fats, the claims of industry had to be balanced against direct consumer demand. For instance, use of millable grains and the composition of national bread were determined by the government in the light of changes in the general grain position. For most foods, retailers registered for supplies on the basis of consumer demand with licensed wholesalers who were mainly established traders. The wholesaler then registered with the first-hand distributor on the basis of his retailers' demand. The country was divided into nineteen divisions and some 1,300 local food control areas, within which retailers' allocations were easily matched with consumer demands, thanks to ration documents and registration.

**PRICES CONTROL.** "Standstill" orders which at the outbreak of war froze the prices of staple foods at their current levels were

soon replaced by specific price orders for individual foods. Price control secured a fair share of food for all consumers, prevented inflation and profiteering. Maximum prices and profit margins were fixed for all stages of distribution. For some agricultural commodities there were also minimum prices to encourage production. Where necessary, the prices of staple foods were kept down by subsidies from the exchequer. By 1943, 95 p.c. of the average household's outlay on food was on controlled commodities.

**CONSUMPTION.** By the end of 1943 essential foods were rationed in specific guaranteed amounts, most other foods on the points and personal points rationing schemes which allowed freedom of choice. Milk, eggs, and oranges were subject to controlled distribution, but potatoes and bread remained unrationed throughout the war, rationing of bread being introduced only on July 21, 1946. Extra allowances were provided for children, expectant and nursing mothers, invalids, and workers unable to use canteens. Supplies to catering establishments were controlled according to the number of meals served, to meet the requirements of floating populations. No ration coupons had to be given up for meals, but these were limited to three courses, with a maximum price of 5s. except in certain restaurants which were allowed to charge in addition a "house charge" varying from a few pence to 2s. 6d. according to their status. The provision of works and school canteens was encouraged, and support was given to local authorities setting up British Restaurants (*q.v.*) for the public.

#### **Unfamiliar Foods**

Food control brought some innovations for the consumer. To keep up nutritional standards, unfamiliar foods like dried egg and soya flour were distributed. Diet contained higher extraction bread and more vegetables. The advisory and publicity services of the ministry had to explain the necessity for such changes to the public. Vulnerable groups were given priority, even subsidised, in supplies of milk and vitamins. The prescription of minimum standards of composition for many foods and the regulation of labelling and advertising were other aspects of food control.

**Food Preservation.** Methods of keeping food edible beyond the time when decomposition would

take place if it were left untreated. Preservation of food depends on the inhibition of decomposition by bacteria, moulds, and yeasts, collectively termed micro-organisms, of the organic matter composing foods. It is the object of the food preserver so to treat his products that either the micro-organisms are killed or their development is arrested.

Salting and smoking are methods of great antiquity, and are used in particular for meat and fish, which may be packed in salt or, after brining, may also be smoked by exposure to the smoke of smouldering wood. In canning, all putrefactive organisms are destroyed by heat after the food has been enclosed in hermetically sealed containers.

#### **Pasteurised Milk**

Milk is pasteurised, by two main methods: (1) by the "holder" method it is heated to 138–150° F. and kept at this temperature for 30 minutes; (2) by the high-temperature-short-time process, it is heated for 15–20 seconds to 159.8°–162°F. In both methods the milk is rapidly cooled after heating.

Refrigeration reduces the temperature of food to the point at which no growth of micro-organisms is possible, and as long as this low temperature is maintained, the food will keep. (*See Cold Storage.*)

A recent development of food refrigeration is "quick freezing"; this involves literally the quick freezing, particularly, of fruit and vegetables, as a result of which, when thawed out, they approximate to the quality of the fresh gathered product.

When most of the moisture is removed from a foodstuff (dehydration) and it is thereafter kept dry, micro-organisms have no power to decompose it. Vegetables, particularly potatoes, lend themselves to this treatment. Fruit and fruit pulp can be preserved by sulphur dioxide. Sugar is the preservative in jam (combined with reduction of moisture). Spices have a preservative effect, owing to their essential oil content. Pickles are preserved by brining and fermentation during which lactic acid is produced.

The use of chemical preservatives is prohibited in several countries and limited in Great Britain where, under the regulations of the ministry of Health, the only preservatives allowed are sulphurous acid and benzoic acid.

Preservatives are permitted only in the following food and drinks: sausages, jam, dried fruits, fruit and fruit pulp, beer, cider, fruit juices, alcoholic and non-alcoholic wines and cordials, sweetened mineral waters, crystallised glacé or cured fruit, sugar, cornflour, corn syrup, gelatine, brewed ginger



**Fool.** The court fool of ancient time attired in his motley  
After A. Lambton

beer, coffee extract, and pickles and sauces made from fruits or vegetables. See Canning; Refrigeration.

**Food Storage.** Biological term for the reservation of food for use later when demand exceeds supply. The process is a biological necessity, induced by the lack of conformity between the variations in availability of food and the need for it. Accumulation outside the organism may be the result of anticipation of events, as in human societies, or of instinctive behaviour, as in storage of honey by bees and nuts by squirrels. Alternatively, food may be deposited within an organism by virtue of the physiological tendencies of its cells; this occurs when excess sugar in photosynthesising cells of plants is converted into assimilation starch. Food storage serves in this instance, and in the conversion of sugar into glycogen in the mammal liver, to level down transitory intermittent maxima of concentrations of soluble food so that the stored material may be reconverted during intervening periods to build up concentration. Food stores may provide for the requirements of an organism during dormancy, e.g. the accumulations in the fat bodies in frogs and

hibernating insects. Reserves are laid down in stems and roots of woody perennial plants and in the rhizomes, tubers, corms, bulbs, etc., of others. They are provided in seeds, eggs, and comparable reproductive structures whenever the individual destined to develop from these is not nourished directly by the parent organism.

**Fool** (Lat. *foliis*, wind-bag). Retainer kept in the medieval period, and up to the 17th century, by kings and nobles for their entertainment. He was licensed in the exercise of his antic buffoonery, his fooling and the shrewdness of his tongue, and is scarcely to be differentiated from the jester. The fool wore a special parti-coloured dress, and a cap shaped like a cock's comb with ass's ears, and carried a mock sceptre with a fool's head carved on it, and a bladder at the end of a string.

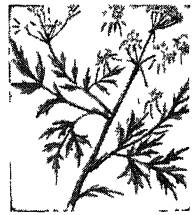
**Fools, FEAST OF.** Medieval burlesque religious festival. A survival of the Roman Saturnalia (*q.v.*), it was originally celebrated on the first day of the year. The Church, although originally opposed to it, eventually allotted special days for its observance. The chief characteristic was at first the inversion of rank. A boy or young man, known by such names as the boy bishop (*q.v.*) or the abbot of unreason (*q.v.*), was chosen to conduct the ritual; but the ceremonies quickly degenerated into buffoonery.

The ass, representing Balaam's ass, the ass which stood by the manger, that on which the Virgin and Child fled to Egypt, or that on which Christ rode into Jerusalem, often played a part. In some places there was a special Feast of the Ass, e.g. at Beauvais, where the flight into Egypt was represented by a girl carrying a baby or doll and mounted on an ass, and the priest dismissed the congregation by braying three times, the people responding in the same fashion. The Feast of Fools survived until the Reformation, and as late as 1644 at Antibes in France.

**Foolscap.** Properly, the cap worn by fools and jesters, usually conical in shape with bells fastened to it. It is also the common name for a sheet of paper, strictly 17 ins. by 13½ ins., but frequently smaller. This is so called because it had formerly a fool's cap and bells for its watermark.

**Fool's Parsley** (*Aethusa cynapium*). Annual herb of the family Umbelliferae. It is a native of Europe and Siberia, growing chiefly in cultivated ground. It

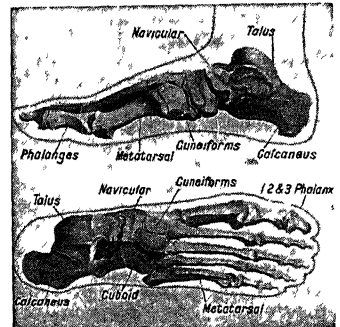
has a spindle-shaped root and a smooth stem about 2 ft. high. The large, wedge-shaped leaves are much divided into small, thin segments. The minute white flowers are massed in compound umbels. Though somewhat like parsley, it is considered that its nauseous odour would prevent any but "a fool" from being imposed upon by the resemblance.



**Fool's Parsley,**  
*Aethusa cynapium*

**Foot.** Lower extremity of the leg on which man stands or walks. The bones fall into three groups: (1) seven forming the tarsus or posterior part of the foot, which correspond to the bones of the wrist; (2) the five metatarsal bones; and (3) the fourteen phalanges, forming the toes. The tarsus consists of the os calcis, which is the largest bone of the foot and forms the heel; the astragalus, which articulates with the tibia and fibula, the two smaller bones of the leg, to form the ankle joint; and five smaller bones—the scaphoid, three cuneiform bones, and the cuboid bone. The metatarsal bones are elongated, and articulate behind with the tarsus and in front with the phalanges.

The phalanges are fourteen in number, three in each of the four outer toes and two in the big toe. The foot is arched in the centre, the posterior pier of the arch being formed by the heel and the anterior by the heads of the metatarsal bones. The dropping of the longitudinal arch produces the condition known as flat foot (*q.v.*). The dropping of the transverse arch allows the heads of the metatarsal bones to crush the nerves of the



**Foot.** Diagram showing the bones of the human foot, seen from above and from the side



part, causing intense pain. Treatment is by exercises to strengthen the muscles responsible for the integrity of the arch and by aids placed in the shoe. Club foot or talipes is a deformity which may be present at birth or acquired during later life. In talipes equinus the heel is drawn up and the patient walks on his toes. In talipes calcaneus the toes are raised from the ground. In talipes varus the foot is inverted, the inner side of the foot being raised, and the patient walking mainly on the outer side. In talipes valgus the foot is everted, and the patient walks on the inner side. These deformities may be more or less corrected by massage, manipulation, the use of suitable splints or other apparatus, forcible wrenching, and in some cases operation. In claw foot, or pes cavus, there is an increased concavity in the arch of the foot.

**Foot.** One of the oldest and commonest measures of length, based upon that of a man's foot, traditionally the king's. The English statute foot is divided into 12 ins. In prosody, foot is the term applied to a group of syllables, one of which is stressed to mark the rhythm forming a part of a verse.

**Foot.** Name of a British family of politicians. Isaac (b. 1880) became a solicitor in the Plymouth firm of Foot and Bowden, and 1922-24 represented Bodmin as Liberal M.P., also 1929-35. He was secretary of Mines in the National government, 1931-32, lord mayor of Plymouth 1945-46, and in 1947 became president of the Liberal party organization.

His son, Dingle Mackintosh (b. 1905), was educated at Bembridge school and Balliol College, Oxford, and called to the bar in 1930. He represented Dundee as Liberal M.P., 1931-45, and was parliamentary secretary to the ministry of Economic Warfare, 1940-44. Another son, Michael, born July 23, 1913, was educated at Wadham College, Oxford, and became a journalist, assistant editor of Tribune, 1937-38. Joining the Evening Standard in 1938, he was acting editor in 1942. Under the pseudonym Cassius he wrote political pamphlets. He represented Devonport as Labour M.P. from 1945, joining the Daily Herald staff the same year.

**Foot - and - Mouth Disease.** Fever mainly affecting cattle, sheep, and pigs, though other animals, including man, are also liable. The disease is periodical only in Great Britain, and is then

the result of imported infection. When there is an outbreak, the district in which it appears is isolated by forbidding the movement of cattle, sheep, etc., in or out of it, and the affected animals are liable to be slaughtered, compensation being paid by the government.

It is highly contagious, the virus, which can live for four weeks, being readily carried by soil, hair, or infected milk. In animals the virus gains entrance through the intestinal mucous

membrane, but in man it is more often the result of direct inoculation from the saliva of infected animals, or from milking cows with eruptions on the udders. As a rule adult animals are not fatally affected, but younger animals die. The incubation period is a few days, when a slight fever is accompanied by ulcers in the mouth and on the feet. A weak solution of permanganate of potash is a good local application. See Bacteriology.

## FOOTBALL: ASSOCIATION AND RUGBY

George F. Allison and Major H. B. T. Wakelam

*The two most popular winter games in the United Kingdom, with both players and spectators, are here described and their history told, the one by the former manager of the Arsenal F.C., the other by a well-known writer and radio sports commentator on Rugby*

**ASSOCIATION FOOTBALL.** At the beginning of the 20th century, it was justifiable to refer to Association football as an English game. Forty years later, it was played in nearly every country in the world, taking hold even in America. Instead of showing others how to play, British teams had to struggle grimly against those of other countries.

Football is still an English game, however, in the sense that it had its origin in England. It survived despite royal edicts forbidding the people to play "such an impertune game." Historians of the 13th century record that "annually on Shrove Tuesday, London schoolboys went into the fields immediately after dinner to play at the celebrated game of ball."

### Forbidden by Law

Its popularity grew, and in 1349 Edward III forbade it by law. Again, in 1389, Richard II passed an Act for the purpose of encouraging shooting, and forbade throughout the kingdom "all playing at tennis, footballe," and various other games. In 1401, Henry IV repeated the embargo. In 1458 James III of Scotland decreed that "footballe and golfe be utterly put down." This football, of course, was not of the organized kind of today—in some matches between rival villages, the goals were two or three miles apart and the contests went on from two o'clock to sunset.

To the schools of Westminster and Charterhouse belongs the major share of the credit for the origin of the rules governing the association code, though other public schools played football in various forms, some of them differing only in minor degree.

The Football Association of England, supreme authority of the game, came into being at a meet-

ing held in London in October 1863. At the beginning of the season 1866-67 only ten clubs were affiliated to it. The first organized football club in England was one formed in Sheffield in 1857; not until 1866 was the first inter-city match played in Battersea park between London and Sheffield.

In 1867 the now famous amateur Scottish club, Queen's Park, Glasgow, was started by a few young enthusiasts. This club built for itself a marvellous arena, Hampden Park, the largest in the British Isles, where the England v. Scotland international match takes place every two years. The attendances at these matches have on occasion neared 150,000.

In 1871 the association passed the following simple resolution: "That a challenge cup be established, open to all clubs belonging to the Football Association." The Association was virtually without funds, and the £25 needed to buy the unpretentious cup was provided by the clubs. Fifteen entered in the first year of the cup competition.

In 1872 the first real international match between U.K. countries was played in Scotland. Within the next few years the game had progressed so much that internationals between England, Scotland, Ireland, and Wales had become established.

Professionalism was officially sanctioned in the year 1885. In 1888 the Football League came into being. At its outset it embraced 12 clubs—Preston North End, Wolverhampton Wanderers, Bolton Wanderers, Aston Villa, West Bromwich Albion, Everton, Derby County, Notts County, Burnley, Stoke, Accrington, and Blackburn Rovers.

There are now approximately 40,000 amateur clubs, and about

three-quarters of a million amateur players affiliated to the Football Association; while there are only about 400 clubs which engage professionals, to the round figure of 5,000. Probably two-thirds are part-time footballers.

Apart from the men who are paid to play, and salaried officials, money cannot be made out of football. The big professional clubs may not be run for personal profit. Some may show a big balance at the end of a successful year, but every penny must go back to the game in some form or another.

#### League and Cup Competitions

In the very first season in which there was both a league and a cup competition, Preston North End carried off both honours, winning the league competition without losing a match, and winning the cup without having a goal scored against it in the competition. It is unlikely that such a dual feat will ever be equalled, though Aston Villa won the cup and the league championship in the same season—in 1895.

The fact that the cup competition was open, at its inception, to any club affiliated to the Football Association accounted for the title Football Association challenge cup. It is now generally referred to as the English cup, despite the fact that Welsh clubs enter in goodly numbers, and that in 1927 the trophy was taken by a Welsh side, Cardiff City.

In the early days of the F.A. cup the final ties were played at Kennington Oval; and in 1876, '77, and '78, it was won by the Wanderers. According to the rule then obtaining, the trophy became the property of triple winners; the Wanderers handed it back to the organizers, however, and it remained as the cup, never to be won outright. But it was stolen from a Birmingham shop window in 1895, while on show after an Aston Villa victory. Nobody, except the thieves, knows what happened to the precious piece of silver. Another cup was provided at a cost of £25, and this remained the trophy until 1909. In that year it was won by Manchester United, whose officials ordered an exact replica for boardroom decoration. The Football Association decided that this was not right. They ordered a new cup, at a cost of £50, copyrighted the design, and handed the previous trophy to Lord Kinaird, first president of the F.A., who had himself been in the winning side five times.

Immediately after the First Great War, finals were played on a club ground—that of Chelsea; but in 1923 Wembley was chosen for the final, and the biggest crowd which has ever assembled for any game turned out to see Bolton Wanderers play West Ham United. The gates of the ground were rushed, and tens of thousands hustled through without paying, to take up positions on the actual playing pitch. That scene brought a new cup final era—admission by ticket only, with the tickets limited to a trifle less than one hundred thousand. It is no unusual thing for cup final ticket applications to number over half a million. (See Association Cup.)

From the original twelve, the Football League gradually grew in numbers, and in 1892 a second division was formed. For a short while promotion from and relegation to this second division was decided by test matches, played at the end of each season, between the lowest pair of the top class and the leading pair of the second class. In due course, however, these test matches were abolished, and promotion for the two top clubs of the second division and relegation for the two lowest clubs in the first division at the end of each season became automatic.

#### League Organization

Football League membership increased to twenty-two per section immediately after the First Great War, and two new sections, southern third and northern third, came into being with automatic promotion and relegation. Starting with 1924, Huddersfield Town won the first division championship in three successive seasons, being the first club to do this. Arsenal equalled this feat in the 1933-34-35 seasons.

Much the same system, so far as promotion and relegation are concerned, was adopted in Scotland, with interruptions from time to time in the relegation and promotion regulations. Scotland also introduced an annual knockout cup competition very much on English lines, and, in 1946, a league cup competition.

On terms arranged between League clubs a player may be transferred from one to another, though no player can be transferred unless he is willing. If he does move, he can be paid only what is called presumed accrued share of the benefit money which he would have received from the transferring club if he had stayed

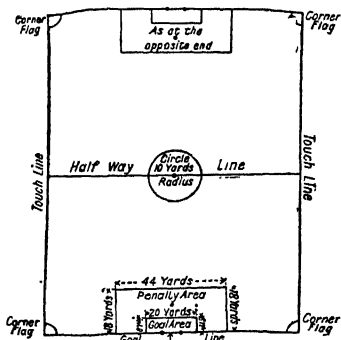
for the qualifying five-year period. As there are maximum wage rules no player is better off financially so far as direct remuneration for playing the game is concerned, by changing from one club to another.

A player is eligible to play in league games immediately his signing for the club has been registered, but his signing must have been registered for 14 days before a player may play in the F.A. cup competition; and in the latter competition a player is not allowed to play for more than one club in any one season.

#### Transfer Fees

In 1905 Middlesbrough paid the first £1,000 fee to secure the services from Sunderland of Alf Common. From that transaction the fees paid and received for star players went up and up—to £10,890 for David Jack (1928); £14,000 for Bryn Jones (1938); £20,000 for Tommy Lawton (1947); £25,000 for J. Morris, and £26,000 for Eddie Quigley (both 1949). From time to time attempts to limit transfer fees have been made, but a limit of £350 per player made in 1908 did not last even one season. No part of the fee is paid to the footballer himself.

ASSOCIATION RULES. The game is played on a ground marked as shown below. The circumference



Football. Diagram showing lines and dimensions of Association football ground

of the ball must not be more than 28 ins. nor less than 27 ins. The weight at the start of the game must not be more than 16 oz. nor less than 14 oz.

The game is played by two teams, each consisting of not more than 11 players, one of whom is the goalkeeper. One of the other players may change places with the goalkeeper during the match, provided notice be given to the referee before such change is made. Apart from the goalkeeper, a team can be made up



Football. The Association game. 1. Scoring a goal. 2. Breasting. 3. Heading. 4. Dribbling down the wing. 5. Goalkeeper saving a good shot. 6. Over-head clearance. 7. A throw-in. 8. Combination. 9. Punching clear

in any way in the positional sense. A goalkeeper must wear distinctive colours, and no player may wear anything which is dangerous to another player.

The appointed referee must enforce the laws and decide any disputed point. His decision on points of fact connected with the play must be final so far as the result of the game is concerned. His jurisdiction begins from the time he signals the kick-off, and his power of penalising extends to offences committed when play has been temporarily suspended, or when the ball is out of play. He must, however, refrain from penalising in cases where he is satisfied that by doing so he would be giving an advantage to the offending team. Two linesmen should also be appointed, whose duty (subject to the decision of the referee) is to indicate when the

ball is out of play, and which side is entitled to the corner-kick, goal-kick, or throw-in.

The duration of the game is two equal periods of 45 minutes unless otherwise mutually agreed upon, subject to allowances being made in either period for all time lost through accident or other cause, the amount of which is a matter for the discretion of the referee; and that time must be extended to permit of a penalty-kick being taken at or after the expiration of the normal period.

At the beginning of the game, choice of ends and the kick-off is decided by the toss of a coin. The team winning the toss has the option of choice of ends or the kick-off. When re-starting after half-time, ends are changed and the kick-off taken by a player of the opposite team to that of the player who started the game.

The ball is out of play when it has wholly crossed the goal-line or touch-line, whether on the ground or in the air, and when the game has been stopped by the referee. A goal is scored when the whole of the ball has been properly propelled over the goal-line, between the goal-posts and under the cross-bar. The team scoring the greater number of goals during a game is the winner.

A player is off-side if he is nearer his opponents' goal-line than the ball at the moment the ball is played unless: (a) he is in his own half of the field of play; (b) there are two opponents nearer to their own goal-line than he is; (c) the ball last touched an opponent or was last played by him; (d) he receives the ball direct from a goal kick, a corner kick, a throw-in, or when it is dropped by the referee. (It is not an offence for a player to be in an off-side position. He can be off-side only if interfering with the play of an opponent or seeking to gain an advantage.)

#### Rules Relating to Penalties

A player is penalised if he intentionally: (a) kicks, strikes, or jumps at an opponent; (b) trips, including throwing or attempting to throw, an opponent by use of the legs, or by stooping in front or behind him; (c) handles the ball, i.e. carries, strikes, or propels it with the hand or arm (this does not apply to the goalkeeper within his own penalty area).

There are several other offences, some punishable by free kicks from which goals may be scored direct, and others by indirect free kicks, from which goals can be scored only if the ball is touched by a second player. Most offences by defenders, in the penalty area, are punished by the award of a penalty kick, during the taking of which all players, except the kicker and the goalkeeper, must stand outside the penalty area, and outside the arc of the circle. The goalkeeper must stand, not moving his feet, under the cross-bar, until the ball is kicked from the penalty spot. When free kicks are taken all opposing players must stand at least ten yards from the ball, unless they are on their own goal-line between the goal-posts. A player taking a free kick or a corner kick must not play the ball a second time until it has been played by another player.

When the whole of the ball passes over a touch-line, either on the ground or in the air, it is thrown in from the point where it crossed the

line, in any direction, by a player of the team opposite to that of the player who last touched it. If the ball is improperly thrown in, the throw-in shall be taken by a player of the opposing team. When the whole of the ball passes over the goal-line, excluding that portion between the goal-posts, either in the air or on the ground, having last been played by one of the attacking team, it is kicked direct into play beyond the penalty area by a player of the defending team. If the ball is not kicked beyond the penalty area, *i.e.* direct into play, the kick shall be retaken. If a player taking a goal kick plays the ball a second time after it has passed beyond the penalty area, but before it has touched or been played by another player, an indirect free kick is awarded to the opposing team, to be taken from the place where the infringement occurred.

When the whole of the ball passes over the goal-line, excluding that portion between the goal-posts, having last been played by one of the defending team, a member of the attacking team takes a corner kick. A goal may be scored direct from such a kick.

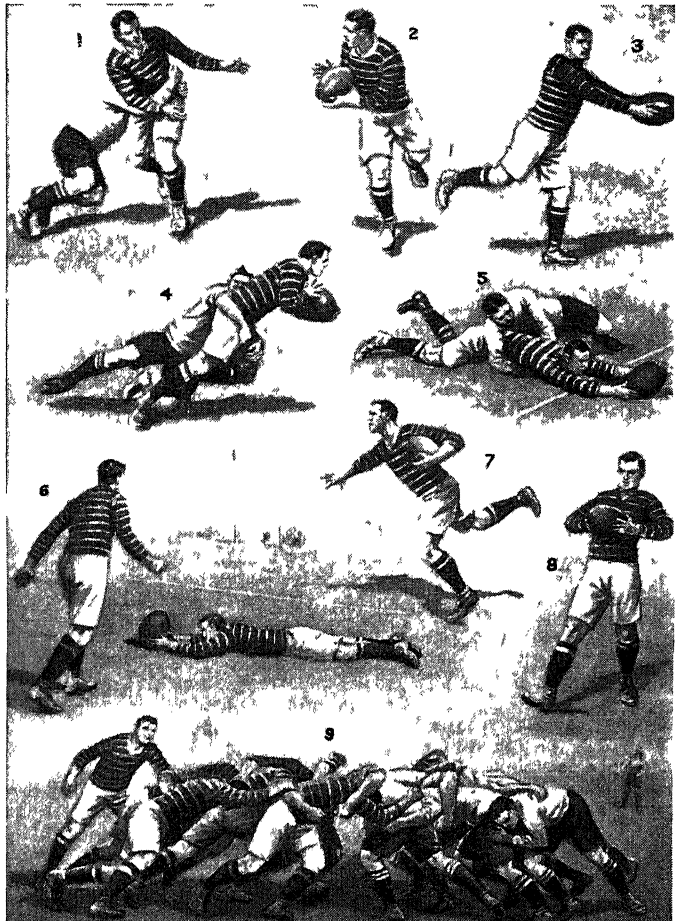
George F. Allison

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**RUGBY FOOTBALL.** It is to one William Webb Ellis, a boy at Rugby School, who, in 1823, "first took the ball into his arms and ran," that the beginning of Rugby football is usually credited. Sixteen years later, Albert Pell, an old Rugbeian, introduced the game at Cambridge, where in 1848 a not very successful meeting of interested parties was held in an endeavour to frame a code of rules.

**Developed by the Schools**

Other schools were gradually adopting the Rugby game, notably Marlborough, an offshoot of Rugby, founded in 1843, and Cheltenham, which can claim to be the originator of the numerical scoring system, this being generally adopted in 1886. From the Old Boys' team of the now defunct Blackheath school, the old Blackheathens, there arose, in 1862, the Blackheath R.U.F.C., first acknowledged club in the game. Richmond followed in 1863 (the year of the first Blackheath v.



Football. The Rugby game. 1. Passing on being tackled. 2. Taking a pass. 3. A drop kick. 4. A tackle. 5. Scoring a try. 6. Place kicking. 7. A dash for a try. 8. Making a mark. 9. A scrum

Richmond match), and then came Manchester, Bath, Bradford, Liverpool, Harlequins (known as Hampstead until 1870), Wasps, and other formations. In 1869, Oxford University took up the game, and, in 1870, at Auckland, Rugby first appeared in New Zealand.

On Jan. 26, 1871, a red letter day, Blackheath, Richmond, Wellington College, Guy's Hospital, Harlequins, King's College, S. Paul's, Civil Service, Marlborough Nomads, Queen's House, West Kent, Wimbledon Hornets, Gypsies, Clapham Rovers, Flamingoes, Law, Lausanne, Addison, Mohicans, and Belsize Park met in London to found the Rugby Union. On March 27, 1871, came the first international, at Raeburn Place, Edinburgh, when Scotland beat England by one goal and one try to one try. Teams were then 20 a side—made up of 13 forwards,

three half-backs, one three-quarter and three full-backs.

In 1871-72 Oxford and Cambridge met for the first time, and, in 1873, the Scottish Union was formed, the Irish following in 1879, the Welsh in 1880.

In 1875 it was decided that should no goal be kicked, or should an equal number of goals be kicked by both sides, matches were to be decided by a majority of tries. Previously no match could be won unless a goal was actually kicked, unconverted tries not counting in the reckoning.

In the same year Oxford and Cambridge took the field 15 aside instead of 20, a step which was followed for internationals in 1877, the year of the birth of Rugby in France, and also that of the first Navy-Army match.

Gradually the game became more open and less of a rough-and-

tumble, a big improvement coming in 1881 when three three-quarters were first seen in international matches, but a bigger stride still was due to the Oxford sides of 1881-83 when the art of the half-back passing game was brought out by Alan Rotherham.

In 1885 Paris R.F.C., the first French team to cross the water, appeared against the Civil Service at Dulwich, but more important still was the introduction in the same season by the Cardiff club of the four three-quarter line-up, though this was not generally adopted until 1893-94.

#### First British Visit to Australasia

The first British touring team visited Australasia in 1888, a New Zealand side, known as the Maoris, paying a return visit the same year, and then, in 1890, the International Board was formed. This board nowadays consists of 10 representatives, four from the Rugby Union (never the "English" Rugby Union), and two each from the Scottish, Irish, and Welsh Rugby Unions.

To Rosslyn Park (founded in 1879) goes the honour of being the first club to make an official trip to France—in 1893, when it beat the Stade Français by three goals and three tries to nil.

For some time already there had been discussion concerning the payment of "broken time" to players, who, by force of circumstances, had to sacrifice pay to take off the time to travel to and take part in, matches. The Rugby Union considered the matter at a very long and spirited meeting, but the voting went against payment, the result being the so-called split and the formation of the Northern Union Football League (now the Rugby League), with its 13-a-side teams and its own code of playing laws.

In 1902 Canada sent over her first representatives to the U.K., and in the 1905-06 season came the first meeting of England and France. That season, too, new scoring values were adopted; and a New Zealand team under Dave Gallaher arrived in Britain, shaking up the home players and returning with a record of thirty-two wins against one defeat, and a score of 868 points to 47.

The visit of Paul Roos's South Africans of 1906-07 helped still more, and there followed the Adrian Stoop era in English Rugby. This farsighted genius of the game, first with his own club, the Harlequins, and then with the English fifteen, adopted and im-

proved a new style of play and for some years the Englishmen carried almost everything before them.

More spectacular play meant greater popularity amongst the watching public, and this led to the purchase, in 1907, of the Rugby Union ground at Twickenham, the first match there being played between Harlequins and Richmond on the first Saturday in Oct., 1909. The opening international was England v. Wales in Jan., 1910, England winning by eleven points to six and scoring direct from the kick-off. Stoop caught the ball from this kick and, after a short run, started a movement which finished in the scoring by F. E. Chapman of Westoe of the first Twickenham international try. Twickenham accommodates over 70,000 spectators.

After the 1914-1918 war, came a run of English successes, usually called the W. W. Wakefield era. It was chiefly remarkable for a very highly specialised type of fast and intelligent forward play in conjunction with one of the best pairs of half-backs the game has ever produced, C. A. Kershaw and W. J. A. Davies. C. G. Porter's New Zealanders arrived in 1924 played 30 matches and won them all. The same year the home countries under R. Cove-Smith, visited S. Africa, registering nine wins, nine losses, and three draws.

#### Seven-a-Side at Twickenham

In 1926 another New Zealand team, this time the Maoris, came over to win 22 of their 31 matches. That year, too, was the first in which the seven-a-sides were played at Twickenham. Also the laws of the game were redrafted.

After an Australian touring side, the "Waratahs," led by A. C. Wallace (winning 24, losing five, and drawing two) had paid the home countries a visit in 1927, D. J. MacMyn of Scotland captained a British side to the Argentine. Here they won all of their nine matches, scoring 295 points against nine. Then in 1930 another home touring party, captained by F. D. Prentice, went off to Australasia, winning 20 and losing eight matches.

In 1931-32 came the third South African visit, B. L. Osler captaining a side which relied almost entirely on a fine pack of forwards for its results. It achieved 23 wins and two draws, against only one loss, at Leicester, to the combined Leicester and East Midlands team.

In 1931 occurred the split with France, owing to a difference of

opinion somewhat similar to the 1893 dispute at home. Not until the opening months of the Second Great War was this disagreement finally resolved.

The first official trip to the U.S.A. was made in 1934, W. J. Leather taking over the Cambridge University team, which played four matches and won them all with ease, causing a sensation by speedy running and open methods.

Then in 1935-36 came yet another New Zealand trip to this country, J. E. Manchester leading a side which won 24 matches, drew one, and lost three, going down before Swansea, Wales, and England. To Swansea, the "All Whites," thus went the honour of being the first home club to defeat a New Zealand touring team.

#### The Calcutta Cup

In 1879 the original Calcutta Football club was disbanded, and to mark this occasion it presented a cup to the Rugby Union to be played for annually between England and Scotland, a game generally accepted as the greatest of the year. The famous Barbarian club came into existence in 1890. Since then it has gone from strength to strength, and to be a Barbarian, which can happen only by invitation, is the ambition of every player.

**RUGBY UNION RULES.** The game of Rugby is played between two teams of 15 a side. It is played with an oval ball, 11 to 11½ inches long, 24 to 25½ inches in circumference, and weighing 13½ to 15 ounces. Usually a 15 consist of eight forwards, two half-backs, four three-quarters, and a full-back, the last seven being known as the backs as opposed to the rest, the forwards. The normal line-up is as follows:

#### Full-back.

Right wing three-quarter.  
Right centre three-quarter.  
Left centre three-quarter.  
Left wing three-quarter.

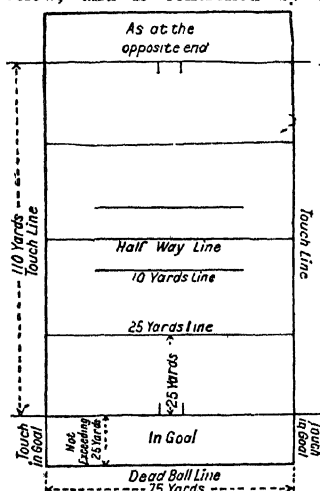
Stand-off (or outside) half.  
Scrum (or inside) half.

- 3 { Flank front row forward.  
Middle front row forward  
("hooker").
- 2 { Flank front row forward.  
Second row forward.
- 3 { Second row forward.  
Outside back row forward  
("winger").
- 3 { Middle back row forward.  
Outside back row forward  
("winger").

This gives the 3-2-3 "pack" of the forwards, though there is quite a common variation, 3-4-1. There is also an outside variation, emanating from New Zealand, in

which the outside half becomes the 1st five-eighth, and one of the centres the 2nd five-eighth, thus leaving only three three-quarters.

The game is played on a ground marked out as shown below, and is controlled by a



Football. Plan of Rugby football ground

referee, assisted by two "touch judges," whose duties include the marking by upraised arm and flag of the places where the ball, or player carrying it, crosses the touch-lines in the course of play. The referee is the sole timekeeper and judge of fact.

#### Duration of Play

Play is divided into two halves of not more than 40 minutes each, with a five-minute interval during which the teams change ends. The start of a game is known as the kick-off, the end as no-side. The run of play depends almost entirely upon the laws of on-side and off-side, a broad interpretation of these laws in Rugby being that a player must never be in front of the ball or of a member of his own side who is carrying it. For in Rugby football the use of both hands and feet is permitted. Including as it does the tackle and the scrummage, as well as open running and inter-passing of the ball from one player to another, it has been described as two kinds of game in one, for it allows for skill, tactics, and speed as well as actual physical contact of the players; and though there is a long and elaborate code of laws, much of the fairness and good feeling of the game depend upon unwritten law, and therefore upon the honesty and good sportsmanship of the individual player.

The primary object of the game is the scoring of a try, which is obtained when an attacking player first grounds the ball in his opponents' in-goal (*see plan*). This try can then be converted into a placed goal if any player in the attacking team kicks the ball by a so-called place kick over the opponents' cross-bar without its touching the ground or any player of either team. A goal is scored if the ball has crossed the bar, even though it may have been blown back afterwards, and whether it has touched the cross-bar or either goalpost or not. It is also a goal if the ball passes between the imaginary lines of vertical continuation of the goalposts.

#### Scoring Points

Other methods of scoring are the dropped goal, made when a player drop kicks the ball over the cross-bar during the run of play, the goal from a free kick (this is the "mark"), and the penalty goal. Either of these last two can be taken by means of a drop or a place kick. There is also the very rare "penalty try" awarded at the referee's discretion. The following are the point values:

A try	3 points
A goal from a try (in which case the try shall not count)	5 points
A goal from a free kick, or penalty kick (whether placed or dropped)	3 points
A dropped goal otherwise obtained	4 points

A place kick is made by kicking the ball after it has been placed on the ground for that purpose.

A drop kick is made when a player in possession of the ball lets it fall from his hand or hands to the ground, and kicks it at the first rebound as it rises.

A free kick is a kick allowed for a "fair catch."

A penalty kick is a kick awarded to the non-offending team by reason of the infringement of the laws by their opponents.

Both "free" and "penalty" kicks may be taken by place kick, drop kick, or "punt."

A punt is made when a player in possession of the ball lets it fall from his hand or hands, and kicks it before it touches the ground (no kind of a goal can be scored by this means).

A tackle occurs when the holder of the ball in the field of play is held by one or more players of the opposing team so that, while he is so held, there is a moment when he cannot pass or play the ball.

A scrummage, which can take place only in the field of play

(not in-goal) is formed by one or more players from each team closing round the ball when it is on the ground (this is the loose scrum); or by players of each team closing up in readiness to allow the ball to be put on the ground between them, in accordance with the particular law of the game. This is the "set" or "tight" scrum in which the forwards "pack" down in 3-2-3 or other similar formation. It is the method of restarting the game after non-penal offences, and is perhaps the main feature of Rugby football.

A "line-out" restarts the game after the ball has gone into touch.

H. B. T. Wakelam

THE RUGBY LEAGUE (Northern Union from 1895 to 1922) controls the professional game, particularly popular in Yorkshire, Lancashire, and S. Wales. Test matches are played against Australia and New Zealand.

During the Second Great War, League players were allowed to play alongside R.U. amateurs in services matches, but the two codes afterwards separated again, with London seeing League players only once a year—at the R.L. challenge cup final, played since 1929 (with one exception) at Wembley stadium. The league championship resembles that of the Association Football League.

The rules of the Rugby League include the following differences from the amateur game: there are only 13 players a side (including 6 forwards); only 2 points are scored for any kind of goal (in addition to 3 for a try, as in the Rugby Union); a scrummage is taken if the ball crosses the touch-line, a direct kick to touch (except a penalty kick) being followed by a "scrum back" at the spot where it was kicked; the ball must be immediately heeled back after a tackle.

AMERICAN RUGBY, known in the U.S.A. as football, derives from the Rugby Union game. There are 11 players a side, their object being to achieve a touch-down over their opponents' goal-line. The playing field, including end zones, is 360 ft. long and 160 ft. wide; the actual field of play is divided into twenty 5-ft. sections giving rise to the "grid-iron" pattern. The play, both on the attack and on the defensive, is controlled by signals, definite formations being adopted.

*Bibliography.* Rugby Football, H. B. T. Wakelam, 1936; Rugby Football, C. W. Jones, 1937; Rugger's an Attacking Game. P. Lawless, 1946.



**Football Association.** Governing body of English amateur and professional association football. It was founded in 1863 to establish a definite set of rules to govern both Rugby and Association football, but at a preliminary meeting the representatives of the Rugby clubs objected to the proposal to make hacking illegal, and withdrew. The F.A. was formed into a limited liability company in 1903. Its council includes a president, six vice-presidents, hon. treasurer, ten divisional representatives, eight representatives of the Football League, and one of each affiliated association with membership of at least 50 clubs. *See* Association Cup; Football.

**Football League.** Union of Association football clubs for the purpose of playing matches against one another. The main principle is that every club in a league shall play every other club twice during the football season, once at home and once away. The idea was borrowed from the U.S.A., where it was practised by baseball clubs, and was suggested by W. McGregor of Birmingham in 1888. For further details *see* Football.

**Football Pool.** Competition in which prizes are offered for forecasting correctly the results of League football matches in Great Britain. From 1939 to 1945 the coupons were printed in newspapers and weekly magazines; but since then they have been sent to the client by post. Nearly all promoters offer two types of competition, one involving the selection of a given number of results from a long list of matches, the other all results in a short list. The minimum stake in the former is usually 6d. and the maximum £1. Dividends on this type of pool are calculated by dividing the amount of the stake money, less the promoter's commission and expenses, by the number of correct, or most nearly correct, forecasts.

In the "penny points" pool a forecast has to be made of the results of, say, 12 or 15 matches. Stakes are fixed at a penny per forecast, and winners are determined by the addition of points, one for a home win, two for an away win, three for a draw.

Pools were started in a small way in 1923, but developed rapidly after the Betting and Lotteries Act of 1934 clarified the legal status of off-the-course betting, and some dozen firms formed the Football Pools Promoters' Association. In 1935-36 it was estimated that the average number of weekly sub-

scribers was about 3,800,000, the aggregate stakes received being about £20,000,000. In 1948, total expenditure on football pools by some 10,000,000 subscribers was est. at £61,000,000. A substantial revenue, est. at about £3,000,000 before the betting commission of 1949-50, accrued to the post office, from postage and poundage on postal orders. At Liverpool, the leading English pool centre, the G.P.O. established a special sorting office, inward letters alone amounting to 5,000,000 weekly.

A decision of the court of appeal in 1945 declaring the advertising of football pools in newspapers illegal led to increased personal and postal canvassing. A 10 p.c. duty imposed on stake money Jan. 4, 1948, was doubled in April.

Pools became popular in Sweden, where the government set up a company in 1934 that ran pools on much the same lines as those of the U.K. The biggest prize allowed is £3,700. Most of the profits are used to encourage sport, athletics, and physical training.

**Foot-candle.** In illuminating engineering, the unit of illumination, defined as the illumination, produced by one standard candle at a distance of one foot.

**Foot Drop.** Condition in which the extensor muscles of the toes and the dorsi-flexor muscles of the ankles lose their power owing to poisoning from alcohol, lead, or arsenic, or to shortage of Vitamin B<sub>12</sub> as in beri-beri. The dropping of the foot necessitates high stepping to clear the ground.

**Footie, SAMUEL (1720-77).** English actor and dramatist. Born at Truro, Jan. 27, 1720 he was educated at Worcester College, Oxford, but gave up a legal career to go on the stage. He was a brilliant mimic and brought out at The Haymarket in 1747 a successful entertainment



Samuel Foote,  
English dramatist  
*After Sir J. Reynolds*

called *The Diversions of the Morning*, in which he burlesqued well-known living persons. The magistrates having prohibited its performance, he defied them by issuing a general invitation to his friends to "take a dish of tea with him"—by ticket. With *The Haymarket*, rebuilt by him in 1767, Foote remained connected till 1777, producing there several of his caricature comedies, the best of

which are *Taste*, *The Minor*, *The Orators*, *The Mayor of Garratt*, *The Devil upon Two Sticks*, and *The Capuchin*. He died suddenly at Dover, Oct. 21, 1777, and was buried in Westminster Abbey. His *Dramatic Works* were edited by M. Belder, 1930.

**Footpath.** Narrow path used by pedestrians over which there is a public right of way. In the U.K. the right has usually arisen from some Act of parliament or from dedication of the land by some owner. Dedication may be by deed but usually will be inferred from long use. If a path has been used for 20 years as of right without interruption dedication will be presumed in the absence of evidence (e.g. notices that a path is not a right of way placed near it by the owner) that there was no such intention, or evidence that no one able to dedicate was in possession of the land. After 40 years, dedication is conclusively presumed in the absence of evidence that there was no such intention. In a rural parish the council may repair all footpaths other than those beside a public road. The National Parks and Access to the Countryside Act, 1949, laid on every co. in England and Wales the duty to survey, and publish maps of, all footpaths and bridleways within its area. *See* Right of Way.

**Footplate.** Metal plate on a locomotive which covers the floor where the driver stands, and extends along both sides of the engine and in front of the boiler. It is also a metal floor-plate secured to the end of a railway corridor carriage, which rests and is free to slide upon the end of the next carriage, to form a gangway. *See* Steam Engine.

**Foot-pound.** Work done when a force of one pound weight moves through a distance of one foot parallel to its line of action. *See* Horse-power.

**Foot Rot.** Term usually applied to a disease affecting the feet of sheep. The animal suffers great pain from an acute inflammation of certain structures of the foot, caused by a microscopic organism which infests low and damp pastures. The disease is readily noticed, for infected animals adopt a kneeling position when grazing.

Affected animals must be removed at once to a dry yard or shed. Dryness is absolutely essential, and if the animals are allowed to stand for a short time daily on a floor covered with slaked lime, the healing process is considerably hastened. Foot rot is highly contagious, and since it takes three

weeks to develop, newly purchased sheep should be kept apart from the rest for 20-30 days.

**Forage.** Name for coarse fodder crops, like straw, as distinguished from green and succulent fodder crops. See Fodder.

**Forain, JEAN LOUIS** (1852-1931). French painter. Born at Reims, Oct. 23, 1852, he studied under Gérôme at the Beaux Arts. After contributing to *Le Monde Parisien*, *Charivari*, *Figaro*, *La Vie Parisienne*, etc., he expressed his satirical talent at its best in *Le Courrier Français* and *Le Rire*, and later in the *Pstt*!, an anti-Dreyfusard sheet founded by himself and Caran d'Ache. He was above all the interpreter and castigator, in exquisite draughtsmanship, of the seamy side of Paris life, of conventions and methods of jurisprudence. Two of his most biting satires, *The Law Courts* and *The Tribunal*, are in the Tate Gallery. After the First Great War he went into retirement and painted still life, but his technique as an engraver gave an element of sharpness to his compositions. He died at La Chesnay, July 11, 1931.

**Foraminifera** (*Lat. foramen*, small hole). Minute creatures belonging to the sub-kingdom Protozoa. Many of them are scarcely visible to the naked eye. Most of them are marine. They secrete a limy or membranous shell, usually perforated with minute holes through which thread-like processes of the body protoplasm can be extruded. With the aid of these pseudopodia (false feet) the animal is able to creep about and to secure the particles of organic matter on which it feeds. The ooze of the ocean beds, and the vast deposits of limestone which form so large a portion of the earth's crust, are largely composed of the dead shells of foraminifera.

**Forbes, ALEXANDER PENROSE** (1817-75). Scottish divine. Born at Edinburgh, June 6, 1817, and educated there and at Glasgow, in 1836 he entered the Indian civil service. His health failing, he returned to England and won a Sanskrit scholarship at Brasenose College, Oxford. Ordained in 1844, he was appointed bishop of Brechin in 1848, but moved the centre of his diocese to Dundee, where he built the pro-cathedral. A prominent high churchman, he was tried in the ecclesiastical courts on a charge of heresy, arising out of the statement of his views on the Eucharist contained in his primary charge, and was censured. He died in Dundee, Oct. 8, 1875.

**Forbes, ARCHIBALD** (1838-1900). British war correspondent. Born in Elginshire (now Morayshire), April 17, 1838, and educated at King's College, Aberdeen, he left the university to enlist in the Royal Dragoons, and, while still a trooper, contributed articles to the papers. In the Franco-



Archibald Forbes,  
British war  
correspondent

Prussian War of 1870-71 he made his reputation as correspondent, first of the *Morning Advertiser* and then of the *Daily News*. He reported on the Russo-Turkish and Zulu Wars, being able in the latter to give Great Britain the first news of the battle of Ulundi, 1879. He wrote *Memories and Studies of War and Peace*, 1895. Died March 30, 1900.

**Forbes, DUNCAN** (1685-1747). Scottish lawyer. Born near Inverness, Nov. 10, 1685, he studied law at Leyden, was admitted advocate and appointed sheriff of Midlothian in 1709, and, for his services in suppressing the rebellion of 1715, was made deputy-advocate. Returned to parliament for the Inverness burghs in 1722, he was appointed Lord advocate in 1725 and lord president of the court of session in 1737. In the rebellion of 1745 he strove hard to keep the rebels in check, but his services were coldly received by the Government. He originated the idea of raising Highland regiments, later adopted by Pitt. He died Dec. 10, 1747. Culloden House was his property and in his family for generations.

**Forbes, GEORGE WILLIAM** (1869-1947). New Zealand statesman. He was born March 12, 1869, at Lyttelton, and educated at Christchurch. Entering parliament as member for Hurunui in 1908, he held office as minister of agriculture



George W. Forbes.  
New Zealand  
statesman

and of finance before becoming premier in 1930. In the latter post he was also responsible for foreign and native affairs, scientific research, and railways, and from 1933 he was attorney-general. During his five-year premiership Forbes went to the Imperial Conference of 1930 and the World Economic Conference of 1932. His Coalition government was defeated by Labour at the polls, Nov. 27, 1935. He died May 18, 1947.

**Forbes, (JOAN) ROSITA** (b. 1893). British explorer and author. She crossed the Libyan desert in native costume in 1920-21, and reached Kufara, headquarters of the Mahomedan sect of the Senussi, not visited by Europeans since 1879. She made an expedition to Asir, 1922-23, and a journey across Abyssinia, 1924-25. A fellow of the Royal Geographical Society, she described her adventures in travel books and drew on her experience for novels mostly about the East. Her publications include *The Secret of the Sahara-Kufara*; *From Red Sea to Blue Nile*; *Forbidden Road—Kabul to Samarkand*, 1937; *The Prodigious Caribbean*, 1940. Her autobiography appeared in two parts: *Gypsy in the Sun*, 1944; *Appointment with Destiny*, 1946.

**Forbes, DAME KATHERINE JANE TREFUSIS** (b. 1899). British servicewoman, born March 21, 1899.

A member of the Woman's Volunteer Reserve, 1916-18, she joined the Council of Emergency Service in 1935 and trained women to serve as officers preparatory to the formation of women's services. She was chief instructor at the A.T.S. school, 1938, and then attached to No. 20 R.A.F. coy., A.T.S. During 1939-43 she was director of the W.A.A.F., with the rank of air chief commandant, and was created D.B.E. in 1944.

**Forbes, STANHOPE ALEXANDER** (1857-1947). British painter. Born in Dublin, Nov. 18, 1857, he was educated at Dulwich College, and studied art at the R.A. schools, and with Bonnat in Paris. Influenced by the naturalistic methods of Bonnat, he settled at Newlyn, Cornwall, where he lived until his death, March 2, 1947. It was



Dame Katherine  
Forbes.  
British servicewoman

chiefly through Forbes that the Newlyn school (*q.v.*) obtained its distinctive character. Elected A.R.A. in 1892, and R.A. in 1910, he devoted his last years to studies of the neighbourhood.

**Forbes-Robertson, Sir John-Ston** (1853-1937). British actor, Born in London, Jan. 16, 1853, eldest son of John Forbes-Robertson, art critic and journalist, and educated at Charterhouse and Rouen, he studied art at the R. A. school, and elocution under Phelps. He



Sir J. Forbes-Robertson, British actor

made his stage début, March 5, 1874, at The Princess's, London, as Chastelard, in Mary Queen of Scots. In the same year he appeared with Ellen Terry at Astley's. Associated in turns with Charles Calvert, the Bancrofts, Irving, Wilson Barrett, and John Hare, he achieved his first notable success as Geoffrey Wynyard in Dan'l Druce, at The Haymarket, Sept. 11, 1876. His first venture as an actor-manager was at The Lyceum, Sept. 21, 1895, when he appeared as Romeo to the Juliet of Mrs. Patrick Campbell. His farewell season in London was opened at Drury Lane, March 22, 1913, and closed on June 6. In that year he was knighted.

Gifted with a magnetic personality and exceptional elocutionary ability, he was one of the most popular actors of his time. His Hamlet, the Stranger in The Passing of the Third Floor Back, and Dick Helder in The Light That Failed, were memorable. He toured several times in the U.S.A., and in Germany in 1898. His reminiscences, A Player Under Three Reigns, appeared in 1925. He died Nov. 6, 1937.

Sir Johnston's brother, as Norman Forbes (1859-1932), also won distinction as an actor. His sister, Frances, was the author of several novels. His wife, married in 1900, was May Gertrude (born Dec. 14, 1874), sister of Maxine Elliott (*q.v.*), of Oakland, Calif., who, as Gertrude Elliott, made her first appearance on the American stage in 1894, and later won favour as Peggy, in Mice and Men; Ophelia; Desdemona; Portia; Cleopatra, in Caesar and Cleopatra; Maisie, in The Light That Failed; Stasia, in The Passing of the Third Floor Back. Their daughter, Jean Forbes-

Robertson (born March 16, 1905), was outstanding as Peter Pan in several Christmas productions, also in Berkeley Square, and Time and the Conways. She formed her own company in 1934.

**Force** (Lat. *fortis*, strong). Fundamental conception defined by Newton as that which changes or tends to change the motion of a body upon which it acts. Newton's second law of motion states that the rate of change of momentum is proportional to the impressed force, and takes place in the direction in which the force acts. Now momentum is equal to  $mass (m) \times velocity (v)$ , and assuming the mass remains constant the rate of change of momentum is given by  $mass \times rate\ of\ change\ of\ velocity = mass \times acceleration (a)$ . Hence the force ( $f$ ) may be defined by the equation  $f = kma$ , where  $k$  is a constant which is made equal to unity by appropriate choice of units of measurement. In the C.G.S. system the unit of force, the dyne, is that force which produces unit acceleration (one cm. per sec. per sec.) when it acts on a mass of one gram.

The resultant of two forces acting on a body may be obtained by drawing two straight lines, to a definite scale representing the respective magnitudes of the forces, and in the directions in which the forces act on the body. If the parallelogram is completed then the resultant force is given in magnitude and direction by the diagonal drawn from the corner where the two forces act. Force was once regarded as a muscular conception; now it is realized that there are electrical, magnetic, and gravitational forces.

**Forced Loan.** Money taken by kings and other rulers from their subjects by compulsion, but with the promise of repayment, which thus differentiates it from taxation proper. Something of this kind has been done almost as long as society has existed, but in England it first became prominent in the time of Charles I. In 1626 Charles resorted to the device of a forced loan. He dismissed Coke from the chief justiceship for denying its legality, and he punished those who refused to pay by billeting soldiers upon them and in other ways. The question was tested in the courts of law by the Five Knights' Case; in this the judges' decision implied that the king alone could decide whether or not a loan was illegal. To this the parliament replied by the Petition of Right, which declared the exaction of

"any gift, loan, benevolency, or tax without common consent by Act of Parliament to be illegal."

**Force Majeure.** English legal term. A force majeure clause is sometimes inserted in contracts to exempt the parties from liability for loss in certain circumstances. The expression is taken from the Code Napoléon. On the Continent the effect of such a clause is to exclude liability for loss due to circumstances independent of the will of man and not under his control. In England its meaning is not fixed but depends in each case on the nature and general terms of the contract. Alternative expressions, each with a slightly different meaning, are *vis major*, Act of God, inevitable accident.

**Force Ouvrière, LA.** See Confédération Générale du Travail.

**Forceps.** Instrument consisting of two blades for grasping or compressing tissues or objects. The midwifery forceps, used for assisting delivery in difficult labour, is one of the most beneficent instruments ever invented. There is some evidence that forceps of a kind were used in childbirth at Pompeii, and in the 10th century by Arabian physicians. The knowledge was, however, entirely lost, and was rediscovered about the beginning of the 17th century by Peter Chamberlen, a Huguenot refugee, who fled to England. Chamberlen and his sons and grandsons kept the secret in their family for nearly one hundred years, and it was not until 1733 that Chapman published a full description of the midwifery forceps. The word forceps meant an instrument for holding hot iron (Lat. *formus*, hot; *capere*, to grasp). A form of forceps is employed in nearly all surgical operations, and by dentists, watchmakers, etc. See Dentistry illus.

**Forcible Entry.** Term used in English law. By a statute of Richard II, it is forbidden for anyone claiming land to make a forcible entry on it. However good his title, he must not assert it by force, or he will be guilty of a breach of the peace, and be liable to a fine.

**Forcible Feeding.** Administration by force of food to a person who refuses to take it. Liquid nourishment is introduced into the stomach through a tube passed down the throat, or sometimes through the nostril. The procedure is often necessary with mental patients, or prisoners who refuse to eat. See Hunger Strike.

**Forcing.** Art of bringing flowers, fruit, and vegetables to a state of maturity at an earlier date than

in ordinary circumstances. Any heated greenhouse can be used as a forcing house, but where this is not available fresh stable manure may be spread at the bottom of a pit, about 3 ft. in depth, and, when the rank steam has escaped, covered with a thick layer of good, rich loam, a cold frame or a series of portable hand-lights being placed over it. The decaying manure will create a high temperature, and the frames can be used for starting all half-hardy plants, and when the temperature of the decaying manure falls, the frames will serve to grow rhubarb, sea kale, and sometimes mushrooms. If the temperature falls too rapidly, it must be restored by the addition of fresh manure and litter. See Gardening.

**Ford** (Anglo-Saxon). Point in a river or lake at which man or beast can cross on foot. Fords and bridging facilities have fixed the site of all important riverine towns. Modern London includes the old city, built at the then best bridging point nearest the sea, and Westminster, founded where the Thames could be forded before London Bridge was built.

**Ford, EDWARD ONSLOW** (1852-1901). British sculptor. Born at Islington, July 27, 1852, he studied at Antwerp and Munich. In 1875 he first exhibited at the R.A., becoming A.R.A. in 1888, and R.A. in 1895. Among his works are the Gordon group, 1890, of which replicas are at Chatham and Khartum; the Queen Victoria Memorial, Manchester, 1901; Polly (Tate Gallery). His many portrait busts are marked by delicate modelling. He died Dec. 23, 1901.

**Ford, FORD MADOX** (1873-1939). British author. Son of the music critic Francis Hueffer, and grandson of Ford Madox Brown (*q.v.*), he changed his surname in 1923. He published at 20 his first book of poems, *The Question of the Well*, under the pseudonym Feuil Haig. A prolific writer and brilliant critic, he was a distinguished personality in the society of his day. Among his best-remembered works are two novels written in collaboration with Joseph Conrad: *The Inheritors*, 1901, and *Romance*, 1903. Outstanding, too, was his sequence of four novels in which the characters were set against the background of the First Great War: *Some Do Not*, *No More Parades*, *A Man Could Stand Up*, and *The Last Post*, 1924-28. The founder and first editor of *The English Review* he later wrote *No Enemy*, 1929: *When the Wicked Man*,

1932; *The Rash Act*, 1933. Besides a distinguished biography of Conrad, he wrote monographs on Rossetti and Henry James. He published his reminiscences, *Return to Yesterday* in 1931, and a sequel, *It Was the Nightingale*, in 1934. Other works include critical studies of Henry James and of the Pre-Raphaelites. He knew France intimately, published a book on Provence in 1938, lived in Paris for many years, and died at Deauville, June 26, 1939.

**Ford, HENRY** (1863-1947). An American industrialist. He was born on a farm near Dearborn, Michigan, July 30, 1863, the son of an emigrant farmer from Cork. He found work in an engineering shop in Detroit, and was also for a time a jeweller's assistant. Later he joined the Detroit Edison Co.



Henry Ford, American industrialist

as an engineer, and experimented with a petrol-driven motor vehicle, completed 1892. After success with racing cars, Ford was able in 1903 to found at Dearborn his own company, destined to become the largest motor manufacturing concern in the world.

In 1914 he instituted a scheme of profit-sharing for his employees, and afterwards founded a trade school as part of his self-supporting organization. Something of Ford's independence of character at this time is shown in his much-quoted phrase, "History is bunk." Hoping to use his influence to end the first Great War by negotiation, he

chartered a "peace ship" in 1915, and paid a vain visit to Scandinavia. When the U.S.A. went to war in 1917, Ford made munitions.

His policy of paying operatives at higher rates than were normal led to disagreement with the code put forward in 1933 by the U.S. National Recovery Administration. Although forced to make concessions to the code, he remained an opponent of the New Deal. He was president of the Ford Motor Co. until 1918, and again during 1943-45. He died April 8, 1947.

Ford's only son, Edsel Bryant (1893-1943), was president of the company from 1918 until his death; and a grandson, Henry (b. 1918), succeeded in 1945.

The car that made the Ford name and fortune was the Model T ("tin Lizzie"), of which 15,000,000 were produced between 1908 and 1928. It embodied the principles of simplicity in manufacture and operation, lightness of construction, and cheapness in initial and running costs. Farm tractors, known as Fordsons, found a similar world market. After the First Great War, Ford established works in several countries, including that at Dagenham, Essex, claimed to be the largest in the world. Small 8 and 10-h.p. four-cylinder cars appeared, and in 1931 the V8 (eight-cylinder), a larger vehicle with an exceptional performance for its price. The company produced transport aircraft of its own design, and in the Second Great War operated the gigantic Willow Run plant, where 8,800 Liberator bombers were made. Aero-engines, including over 34,000 of the Rolls-Royce Merlin type, were also turned out by mass production. Consult *My Life and Work*, 1922; *Today and Tomorrow*, 1926, both H. Ford and S. Crowther; Henry Ford, J. G. de R. Hamilton, 1933.

**Ford, JOHN** (1586-c. 1639). English dramatist. Born at Islington, Devon, April 17, 1586, he spent a year at Exeter College, Oxford, and then entered the Middle Temple. His reputation rests on his tragedies 'Tis Pity She's a Whore, 1626; *The Broken Heart*, 1629; and the historical drama of Perkin Warbeck, 1634. He collaborated with Dekker, Rowley, and Webster, with the two first in *The Witch of Edmonton*, c. 1621; with the last in *A Late Murder of the Son upon the Mother*. H. de Vocht's edition of his works appeared in 1932.

**Fordwich**. Parish and village of Kent, England. It is 2 m. N.E. of Canterbury, and was once a



Ford. The American car-builder, Henry Ford, seated in his first model, completed in 1892

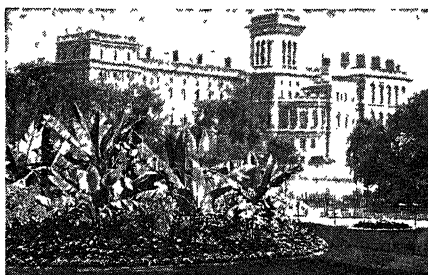
place of importance. In the Middle Ages and later, the Stour, which flows by here, was navigable, and Fordwich was a port serving Canterbury and a corporate member of the Cinque port of Sandwich. It has an old church, S. Mary's, with a Norman shrine. The old sessions house still stands, and there are remains of the port. It was a borough until 1884, when it lost its mayor and corporation under the Act of 1883.

**Forecastle** or **Fo'c'sle**. Forward portion of a ship, usually providing living accommodation for the crew. In new steamers, however, particularly liners, the crew are housed in cabins farther amidships. The term fore-castle is derived from the raised platform, fitted to the bows of medieval warships, from which the archers fired into enemy vessels. A monkey fore-castle is a small deck below the level of the fore-castle proper.

**Foreclosure** (old Fr. *forclos*, shut out). Term used in English law. When a mortgagor has failed to pay the debt in accordance with his covenant, the mortgagee may take possession of the land or other security; but the mortgagor has, at any time, the right to come and say, "Here is your money and interest, give me back my security." This right is called an equity of redemption. If the mortgagee desires to exclude the mortgagor from this equity, he must bring an action to foreclose, when the court orders that if the mortgagor does not redeem within a certain time, generally six months, the equity shall expire, and the mortgagee shall become the owner of the security. See Mortgage.

**Foreign Jurisdiction Acts.** Acts of 1890 and 1913 which give the British crown jurisdiction over British subjects in certain foreign countries to the exclusion of the courts of those countries. Jurisdiction usually arises from some treaty, but if a country is not subject to any regular government the Act confers jurisdiction. Of recent years, as the legal systems of even backward foreign countries have developed, this jurisdiction has decreased. See International Law.

**Foreign Law.** English law treats foreign law solely as a matter of fact. If an English court has before it a case that turns on a question of foreign law, it will not refuse to decide the dispute. For its satisfaction, therefore, qualified lawyers of the country in question must prove in evidence



Foreign Office, London, seen from St. James's Park

what the law is, and on that the case will be decided.

**Foreign Legion** (Fr. *Légion Étrangère*). French corps raised in 1831, to utilise the services of foreigners sympathetic to the French conquests in Algeria. It was formed at first in battalions like infantry of the line, but with varying numbers according to its strength. In 1884 the legion was divided into four battalions, to which a fifth was added in 1891. No Frenchman can serve in its ranks unless he renounces his nationality. The officer commanding is authorised to accept recruits of any nationality without inquiring as to their antecedents, and this has enabled many desperate characters and fugitives from justice to find refuge in the corps. Recruits must be between 18 and 40 and sign for a period of four years with the option of re-engaging.

In peace time the Foreign Legion used to garrison the French colonies in Indo-China and North Africa. It greatly distinguished itself in France in both Great Wars, serving with the Free French forces in 1944-45. Shortly before the Second Great War it was reorganized into two regiments of four infantry battalions, one cavalry regiment, a regiment of artillery, and a battalion of engineers. Attached to each regiment were disciplinary companies known as Zephyrs, in which offenders were drafted for service in the unhealthiest colonies.

The Spanish government maintains a Foreign Legion for service in Morocco.

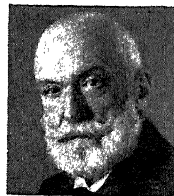
**Foreign Office.** A British government department. Its head, the secretary of state for foreign affairs, has charge of all business affecting the relations of Great Britain with foreign powers. He formulates policy, appoints, sends out, and supervises ambassadors, consuls, and other diplomatic agents, and by various means, not excluding the

use of secret agents, keeps himself acquainted with the course of affairs abroad. The Foreign office is staffed by members of the foreign service which was created in 1943 by the unification of the former Foreign office and diplomatic, consular, and commercial diplomatic services, and was extended in 1946 to include overseas staff of the former ministry of Information.

Until Sir Edward Grey became foreign secretary in 1905 the position was almost invariably filled by a peer, among the holders being Lords Palmerston, Clarendon, Salisbury, Rosebery, and Lansdowne. Before 1782, when the foreign secretary first came into existence, the control of foreign affairs was divided between the two principal secretaries of state. The secretary is assisted by a parliamentary and a permanent under-secretary, and his office, entered from Downing Street, overlooks St. James's Park. A minister of state to assist the foreign secretary was appointed 1943; a similar appointment was made in 1945.

**Foreign Service.** A British government service concerned with international affairs, political, social, and economic. In 1943, the Foreign office and the former diplomatic, commercial diplomatic, and consular services were amalgamated into a distinct service of the crown entirely separate from the home civil service. Recruitment is by competitive entrance examination; a period abroad at the expense of the state follows. The examination is conducted by the Civil Service Commissioners. A proportion of the annual vacancies may be allotted to entrants nominated by a selection board. In 1946 women were admitted on equal terms with men, but their number was limited to 10 p.c. of the total entrants.

**Forel, AUGUSTE** (1848-1931). Swiss psychiatrist and myrmecologist. Born Sept. 1, 1848,



Auguste Forel, Swiss psychiatrist

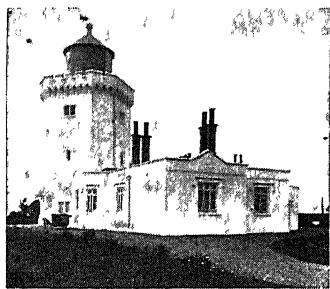
he was trained as a physician, studied psychotherapy, and in 1879 became director of a mental hospital near Zürich, where he remained nearly 20 years establishing

an international reputation as a neurologist, and one of the most eminent alienists of his day. He was also an early supporter of eugenics. His best-known work was *La Question Sexuelle*, 1905, translated into many languages, including English, evolving a new theory of the connexion between nerve fibres and brain cells. After leaving Zurich he devoted himself to a personal crusade, travelling all over Europe to make war against drink and sexual immorality and in support of internationalism and education. At the age of 68, partially crippled by paralysis, he became an active socialist.

From his schooldays his lifelong hobby was the study of ants, and his eminence as a myrmecologist was even more widely based than his repute as a psychiatrist. His collection of ants comprised over 6,000 species, races, and varieties. Forel died July 27, 1931; his autobiography was published posthumously (Eng. trans. B. Miall, 1937).

His brother François Alphonse (1841-1912) became famous for his geographical and geological studies and as a seismologist. Professor at Lausanne, 1869-95, he wrote *Le Lac Léman*, 1886. He died Aug. 8, 1912.

**Foreland, NORTH AND SOUTH.** Two chalk headlands on the coast of Kent, England. The North Foreland, about 2½ m. S.E. of Margate, is the Cantium of Ptolemy, and has a lighthouse 188 ft. above sea level, with a light visible at 20 m. The South Foreland, 3 m. N.E. of Dover, has two light-



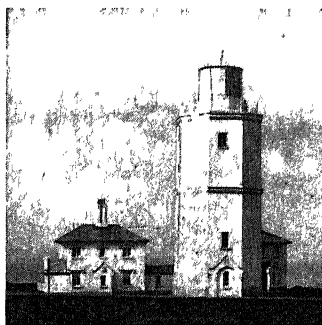
houses respectively 375 ft. and 275 ft. above sea level, and visible at 26 m. and 23 m.

**Foreshore.** Part of a beach or seashore which lies between the extreme limits of high and low water marks, i.e. is covered at high tide and uncovered at low tide. The extent of the foreshore depends partly upon the slope of the ground and partly upon the height

of the tides. The boundary has been fixed, by English law, as the mean between the high and the low water mark. Foreshore is vested in the crown. See *Coast*.

**Forest.** Term originally applied to a royal demesne set apart for the preservation of beasts of the chase and to afford the sovereign facilities for hunting. Not necessarily wooded or uncultivated, it was frequently called forest only because forest law was applied to it. It consisted of vert and venison. The former comprised the high wood, underwood, and turf; the latter the beasts of the forest, chase, and warren. In Scotland the term deer-forest is still used to describe an extensive region quite devoid of timber. In general, however, the word forest (late Lat. *for-esta*, ultimately derived from Lat. *foris*, out-of-doors) now means a large tract of uncultivated land thickly wooded.

Forests are of two kinds—temperate and tropical; and the temperate are subdivided into deciduous forests of oak, elm, maple, beech, birch, and other temperate hardwood trees whose leaves fall every autumn, and coniferous forests of fir, pine, larch, and other evergreens which



Foreland. The North Foreland lighthouse S.E. of Margate and, on left, the chief South Foreland lighthouse, both well-known landmarks on the coast of Kent

produce softwood and pulpwood. Down to historical times, much of central and northern Europe was covered with forest, and even in Great Britain there are today stretches of woodland (e.g. the New Forest) which are remnants of the forests that once clothed the island. Over those parts of Europe most suitable for agriculture and industry, the forests have been gradually cleared. Only Scandinavia, N. Russia, and Finland have extensive forests today.

Much of the forest that existed in N. America until the mid-

19th century has also been cleared though vast stretches remain. Some 450 million acres of the U.S.A.—close on a quarter of its whole area—are still forested. Oregon is now the most productive state. Fire is a serious menace—millions of acres are burnt annually. Canada has more than 750 million acres, of which about 490 million acres are accessible and productive; British Columbia produces more than half Canada's total of pulpwood. Production, that is to say, in N. America, has shifted to the Pacific side of the continent, the best of the areas in the E. having been stripped.

The chief timber exporting country of Europe is Sweden, with 57 million acres of forest. Germany has over 30 million acres; much of it has long been under state control and worked on a scientific system. The making of clocks, brooms, musical instruments as well as the production of timber was encouraged by successive governments. Finland, with 62 million acres of forest, produces timber, wood-pulp, and paper. More than 40 p.c. of the U.S.S.R. is forested; she and Canada possess the world's chief reserves of softwood. All the Russian forests are under government control, but the peasants have the use free of some 73 million acres. The exploitation of the Russian forests, however, presents great difficulty, since timber can be handled satisfactorily only where it can be floated down a river to a port or a manufacturing town, and rivers of Siberia and N. European Russia, where the greater part of the Russian forests lies, flow into the frozen Arctic Sea, and are themselves frozen for a large part of the year.

Oak, the principal temperate hardwood, does not grow S. of the equator; it grows chiefly in the forests of Central Europe, Canada, the U.S.A., and Japan. Great Britain's unique "brown oak" is much in demand for furniture and panelling.

From the forests of the tropics come the most beautiful and valuable cabinet woods. Mexico, Honduras, and other parts of tropical America are the home of mahogany, W. Africa of the so-called African mahogany, India of ebony, Central America and the W. Indies of rosewood and cedarwood. Burma, Siam, India, and Java produce teak, W. Australia the redwood of the eucalyptus tree. But the forests of the tropics



are far more mixed than those of the temperate zones, and are choked with a dense undergrowth and a wealth of climbing plants, so that it is difficult to extract the particular tree required.

The increased demand for timber and wood pulp leads to the decrease of temperate forests much faster than nature unaided can replace them, and governments in both N. America and Europe take steps to conserve their remaining forest, and to replant as trees are cut down. The clearance of large tracts of land formerly under forest has had an adverse effect in parts of N. America, reducing rainfall (large masses of trees cool winds passing over them, with consequent precipitation) and leading to soil erosion by the resulting dry winds. See Forestry.

**Forest Bed.** Series of deposits formed above the Pliocene Weybourne Crag and occurring beneath the glacial boulder-clay cliffs on the Norfolk coast. It comprises a lower fresh-water bed of clayey silt, an estuarine forest-bed (20 ft.) above, with stumps of trees and bones of mammals, and an upper bed of sand and blue clay (2-7 ft.), containing fresh-water shells. See Pliocene.

**Forest Cantons.** Four cantons of Switzerland, enclosing the Lake of Lucerne (Ger. Vierwaldstätter See). They are Unterwalden, Uri, Schwyz, and Lucerne.

**Forester, Cecil Scott** (b. 1899). British author. Born Aug. 27, 1899, he went to Dulwich College. He began as a writer of biographies. A psychological thriller, *Payment Deferred*, was made into a play, and an early naval story, *Brown on Resolution*, into a film. Other successful novels were *The General*, and *The Gun*. In *The Happy Return*, 1937, appeared Horatio Hornblower, a sea captain in the Napoleonic Wars, who was to go through several books and become a commodore and a peer; one Hornblower story, *A Ship of the Line*, won the James Tait Black prize in 1938. *The Ship*, 1943, was a study of the personnel of a cruiser in the Second Great War, based on Forester's journeys in H.M.S. *Penelope*. Settling in the U.S.A., Forester was left paralysed by a serious illness, but continued to write, publishing an outstanding novel, *The Sky and the Forest*, 1948.

**Foresters, ANCIENT ORDER OF.** British friendly society. Founded in 1834 to provide its members and their dependants with weekly allowances during sickness, old age,



Foresters' arms

or widowhood, it is one of the largest societies in the country. It retains much of the traditional ritual associated with membership, but this is not compulsory upon members. It is organized in autonomous courts and districts which owe a certain allegiance to the central body, and the government is vested in the high court of the order which meets annually in different cities. Contributions vary according to the benefits desired. The order has spread to America and the British dominions. See Friendly Societies.

**Forest Gate.** District of Essex, England, and an E. suburb of London. It is 5½ m. by railway N.E. of Liverpool Street station. There are chemical and other industries. Mostly included in W. Ham and E. Ham. Pop. 18,697.

**Forest Hill.** Residential dist. in the London metropolitan borough of Lewisham. It is 5½ m. by electric railway S.E. of London Bridge station. The Horniman Museum, standing in a public park, and built at a cost of £40,000, was opened to the public in 1901. The district was heavily damaged by German bombs in 1940 and flying bombs in 1944. Pop. 16,777.

**Forest Marble.** Name of a geological formation comprising

shelly and flaggy limestones. Alternating with layers of clay or marl, it is one of the Great Oolite group of Jurassic stratified rocks, and occurs in Dorset, Somerset (135 ft. in thickness), Wiltshire, through Oxfordshire into Buckinghamshire, where limestone thins out and is thence represented by clays. The formation is named after Wychwood Forest, Oxfordshire, where it was formerly quarried for building stone.

**Forest Reserves.** Name given in the U.S.A. to areas set aside for the conservation of trees and now known as national forests. Under legislation begun in 1891 and steadily expanded some 178 million acres in 158 forests, including Alaska and Puerto Rico, are administered by the U.S. forest service. Individual states administer 20 million additional acres and local communities a further 2,500,000 acres.

Canada also has forest reserves, about 143,000 sq. m. having been set apart—32,000 in Quebec, 30,000 in British Columbia, 19,000 in Ontario, 14,000 in Alberta.

**Forest Row.** Parish and village of Sussex, England. It is 3 m. S.E. of East Grinstead, with a rly. station, and is a convenient starting-point for a visit to Ashdown Forest. Between Forest Row and East Grinstead are the ruins of Bramletye House, home of the Lewknor family, and theme of a romance by H. Smith. Pop. 3,815.

## FORESTRY AND AFFORESTATION

H. G. Champion, F.R.S., Prof. of Forestry, Oxford Univ.

*An explanation of what forestry is, and how and why it is carried out, in temperate woods and forests, with particular reference to the growth of trees for timber. See also Forest; Timber; and entries dealing with particular trees, e.g. Beech; Larch; Oak*

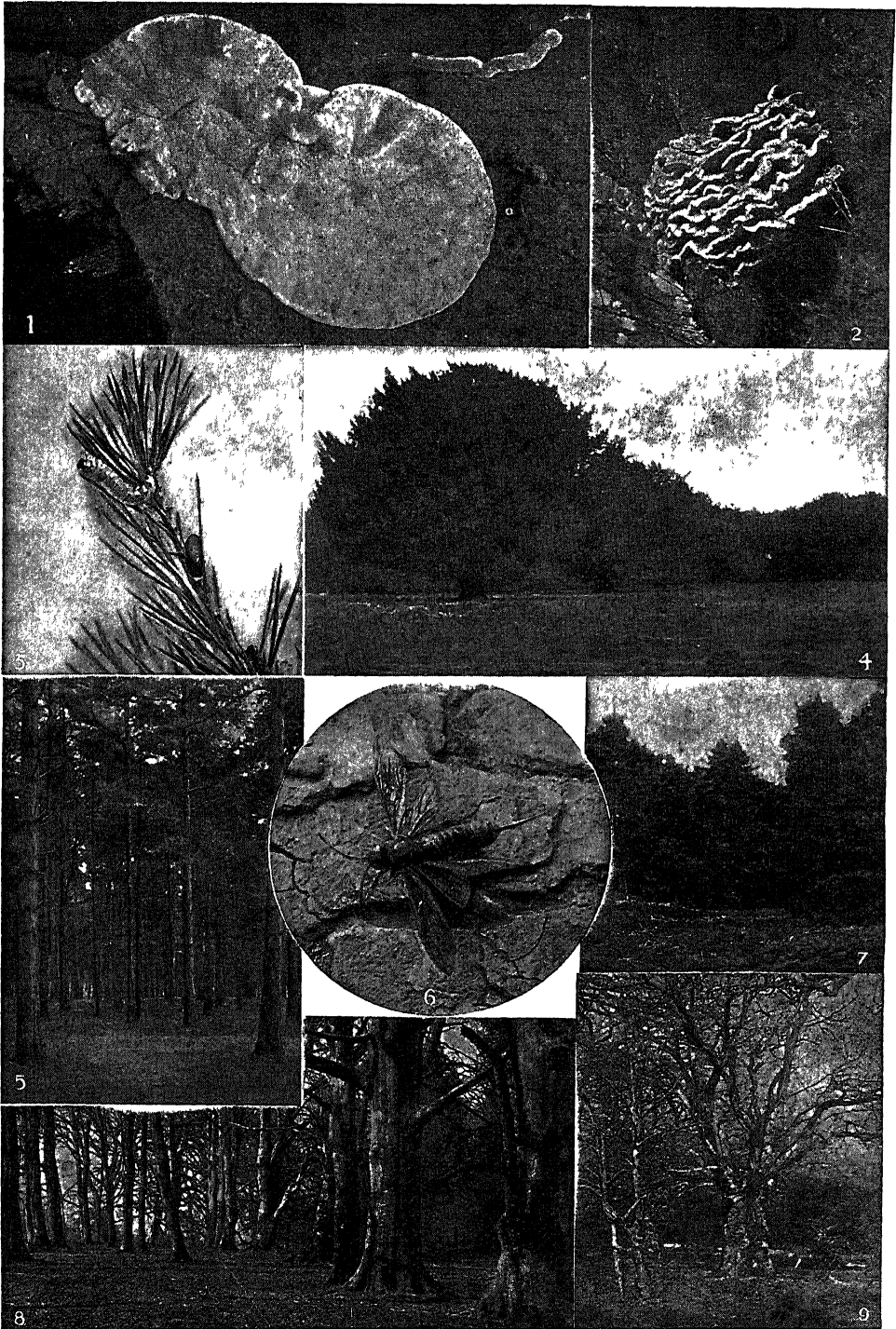
Forestry is the general management of woods and forests, including the creation of woods on bare or scrub covered land. It is an applied science like agriculture, dealing with trees as a crop rather than individually; and also, in the main, with natural tree growth rather than with plantations. It has to do essentially with the growing of trees, though it may extend to the felling and extraction of timber and other natural tree products from the forest, together with the necessary processing.

The value of timber greatly exceeds that of all the other forest products, such as resin, cork, tanbark and charcoal.

The forester must have a fair acquaintance with all branches of forestry. First comes the care of existing woods and the raising of

young crops and plantations, termed silviculture. This involves knowledge of everything affecting the growth of trees as crops and is primarily a biological science based on botany, understanding of soils, and climatology; it includes appreciation of the object, methods, and results of human interference with the natural processes of forest life.

In Great Britain, where self-sown seed from older trees rarely gives sufficient and sufficiently rapid young growth to replace the parent crop, it is usual to plant out small trees raised in forest nurseries. In some types of forest, however, natural regeneration is left to itself, artificial regeneration (including sowing of seed) being used only to supplement the natural process, and in afforestation



1. An outward symptom of internal disease: red-rot fungus, *Fomes annosus*, on Scots pine. 2. Sulphur-tuft fungus, *Polyporus sulphureus*, on oak. 3. Larva of sawfly, *Lophyrus pini*, attacking young pine shoots. 4. Yew forest on Surrey chalk hills. 5. Wood of Scots pine grown

ing in Surrey. 6. Horntail wasp, *Sirex gigas*, whose grub spends several years mining the solid wood. 7. Self-sown pine wood on a Surrey heath. 8. A Surrey beech wood. 9. Neglected oak trees, *Quercus robur*, with much wood but yielding little serviceable timber

**FORESTRY: BRITISH FOREST TREES AND SOME PESTS WHICH THREATEN THEIR GROWTH**

(i.e. creation of new forests, or their re-creation where natural growth has been destroyed).

In the nursery, healthy, vigorous stock of a size found by experience to be most suitable for the planting operation contemplated is raised as quickly and cheaply as possible. Sometimes the seedlings are put out directly into the forest from the seed bed, usually after two seasons' growth; more often they are first lined out in another part of the nursery at some such spacing as 3 ins. by 9 ins. and left to grow another season or two before they are planted out; they develop a more suitable root system as a result of the move. Trees are planted out at various spacings related mainly to the anticipated rate of growth. A slow-growing hardwood like oak may be planted as close as 3 ft. by 2 ft., i.e. over 7,000 plants per acre, whilst a quick-growing softwood such as larch or Douglas fir may be planted at intervals of 5 ft. by 5 ft. (1,742 plants per acre), or even more.

#### Preparing Ground for Planting

Before planting, some preparatory work on the site is usually necessary, for example, clearing undergrowth or weeds, or working up the soil. If there is a thick layer of vegetable matter, ploughing or some other work will have to be done on the planting site so that the roots can penetrate readily into the underlying mineral soil. Draining may also be necessary. Planting can be done in various ways, the object being to get the roots firmly into the soil in as natural a position as possible without undue labour or expense. In some countries seed is sown in patches or lines. The kind of tree to be sown or planted on any given site, or the mixture to be used, has to be carefully selected, taking into account all the factors of soil and situation.

Young trees need protecting from competing weeds, and weeding and cleaning must be continued—for several years in the case of slow-growing trees such as oak—until the branches of the young trees overlap, and weeds no longer menace them. At this thickest stage it is almost impossible to force a way among them, but after some years the lower branches of the young trees die off for want of light, and it is then usual to "brash" or "brush up," by trimming off all the dead lower branches from the ground level up to six or seven feet. At this time, or a little later, trees whose stems

are ahead of the rest of the crop and badly shaped or coarsely branched (known as wolves) are removed, to allow of enhanced growth by adjoining better stems. Then over a long period the tree crop is periodically opened out by thinning, i.e. by removing the less satisfactory stems to give the remainder room for further development. If thinning is too heavy the branches will develop too strongly and the timber become knotty, whilst at the same time the total wood growth on the area is likely to be less than it could be; if it is too light the stems become drawn up and weak.

After a period varying with the kind of tree, rate of growth in height falls off and the aim of further thinning is to maintain good healthy crowns, and thus promote continued steady growth in stem-diameter. One problem of forestry is to find markets for the small timber removed in thinnings.

The age at which wood becomes mature and ready for felling and regeneration, called the rotation age, varies with the kind of tree, and the size of it most in demand. Where timber for sawing is grown the rotation is rarely less than about 60 years for the quick-growing softwoods like larch and spruce, and may be 150–200 years for oak; Scots pine and beech fall between these limits.

#### Coppicing the Wood

Tree crops of maturing or mature age are more open than young woods, and it is possible to have an underwood of smaller stems, especially with hardwoods. This may be planted or semi-natural, of hazel or various deciduous trees such as ash, sycamore, oak, or chestnut, and it is usually cut down (or coppiced) at intervals of 7 to 15 or more years, to yield poles and sticks. Sometimes the whole wood is coppiced, a new crop growing up from shoots from the stumps; this method was prevalent when wood for fuel was needed, and was particularly applied to oak when the bark for tanning was in good demand. Repeated coppicing leads to gradual deterioration of the crop as the stocks get old; where management is efficient, worn-out stocks are regularly replaced. Conifers cannot be managed by coppicing as they do not produce shoots when cut. They are, however, often underplanted (as is the shade bearing beech) below open crops of hardwoods or larch, to keep the ground covered and make fuller use of the land. When the over-

wood is due to be felled the under-planted crop should give a yield of small timber at the same time; hemlock and Western cedar (*Thuja*) are particularly suitable for use in this way.

A combination of coppice with larger trees (coppice with standards) is common. This may originate by the retention of a few picked stems evenly distributed over the area when a young crop is first coppiced. At each subsequent coppicing a few of these standards may be felled to provide larger timber, and a new lot of maiden standards be retained from seedling trees that have come up among the coppice, or by planting, or from the best coppice shoots still standing on a healthy vigorous stock. In time, the crop contains an open sprinkling of standards of several ages and sizes above the coppice growth. The standards are nearly always trees such as oak and ash which do not cast too dense a shade. This form of crop supplies continuously a wide range of material well suited to meet the varied requirements of an agricultural estate.

#### Adequate Space Important

When trees of all ages and sizes occur singly or in small groups throughout the wood, fellings should be made on a cycle, returning to each part of the wood every few years and taking out a selection of trees of all sizes, including some mature, full sized trees, but otherwise removing inferior trees and allowing adequate growing space for all that are kept. To retain the all-aged structure continuous regeneration must be ensured. Such selection forests are coming more and more into favour on the Continent; they call for highly skilled management.

Forests are subject to injury and disease of many kinds. There are risks from natural physical phenomena such as wind, frost, snow, and drought, varying with locality and from year to year. Exposure to strong winds, particularly if they are laden with salt spray, has a general stunting effect on tree growth, whilst storms may uproot or break trees on an extensive scale. A tree that has grown up exposed to wind is always more firmly rooted than one which has grown up sheltered by its neighbours. It is accordingly a guiding principle when arranging the sequence of fellings that trees should never be suddenly exposed to the wind by the felling of others to windward of them; this in turn means so arranging

that the older crops in which there will be heavy timber felling are towards the leeward side of the forest, with the fellings annually moving up the prevailing wind. Trees, *e.g.* spruce, which do not root so deeply, as *e.g.*, oak and pine, and so are more likely to be blown down, must not be planted on exposed sites or left standing alone in felling.

#### Damage by Frost and Snow

Snow also may uproot or break trees, and its weight often bends over young crops beyond recovery, particularly if they have been inadequately thinned. Frost damage is a serious risk in many places. Some species are particularly susceptible, *e.g.* ash, and should not be planted on sites known or likely to be frosty. Late frosts which kill the newly developed shoots and foliage can be very injurious, not only seriously checking growth but also causing forking of the stem or bad curvature where a side shoot takes the lead in place of a frosted leader. Considerable protection against frost damage is afforded to young growth by an overwood. Sometimes a hardy, quick-growing species is mixed with a slower, susceptible one as a nurse crop, to be removed when the danger is over.

Many forest trees are liable to insect damage, especially when growing in pure crops. Thus, it is commonly inadvisable to replant at once an area where a pine crop has been felled, owing to the great probability that the pine weevil, which breeds in the stumps, will attack the young plants and kill a large proportion of them; after about three years the food material in the stumps is exhausted and the weevils can no longer survive. Another very injurious insect burrows in the shoots of young pines and causes serious malformation. Defoliation by caterpillars is common, being particularly conspicuous on oak; it is difficult to prevent, and causes much loss of growth. Insect-eating birds should be encouraged as the most practicable method of minimising insect attacks.

The forester also has to contend against fungus diseases. Some, for example the honey fungus, kill young plantation trees outright; others cause cankerous growths deforming the tree and reducing its value for timber, the larch canker being a common example; yet others cause decay in the heartwood and render the timber worthless. Trees planted on unsuitable sites are prone to fungus

diseases, and some stocks are more susceptible than others. Rodents are the most serious enemy of British forests; in many parts of the country it is impossible to raise a plantation without protection from rabbits. Grey squirrels are destructive of beech, ash, and sycamore. Small rodents and birds, particularly the wood pigeon, are largely responsible for the failure of natural regeneration of oak and beech in England.

Protection against fire is very important, especially in conifer plantations. The forest is divided into blocks of moderate size separated by fire lines kept clear of inflammable material (often by ploughing), look-out towers are kept manned, and organization makes it possible to get men and extinguishing appliances quickly to an outbreak.

An important branch of forestry deals with the measurement of trees and crops, their rate of growth, and their valuation. The work of felling trees and extracting them from the forest with minimum damage and wastage is dealt with by the forest engineer, who often also carries out preliminary saw-milling on the spot.

#### Effect on Soil and Water Supply

Production of timber is often only one of the objects, and not necessarily the most important, of afforestation. Forests exert a considerable effect on the soil and water supply; they moderate temperature and give protection from wind. They also drain swampy land, rendering it more healthy, provide sporting and recreational facilities, and preserve wild life. Taking all the matters applicable to local conditions into consideration, the forester usually draws up a working plan, laying down all operations to be done each year for a period of years (usually 10) in each subdivision of the area, felling and planting, road work, drainage, maintenance operations, and improvements. Where scientific forestry is practised, the fellings and the composition and structure of the crop are usually regulated to give as nearly as possible the maximum yield in perpetuity, though in some cases, *e.g.* in state-owned forests, other considerations than maximum sustained production or maximum financial return may be given weight; thus, less paying kinds of trees may be grown for reasons of amenity.

Great Britain has an exceptionally low proportion of its land area

under forest, only  $5\frac{1}{2}$  p.c. or three million acres, and most of this forest produces far less timber than it might owing to low stocking and poor management. Less than 5 p.c. of British requirements of timber are home grown. There was no state organization or policy until the Forestry Commission (*v.i.*) was set up in 1919. Improvement of management in privately owned woodland is particularly needed in the hardwood forests of oak, ash, and beech, totalling about one million acres.

The climate of Britain is very well suited to the growth of coniferous timber, particularly in the W. parts, where good results have been obtained with some of the trees of the W. American forests, such as Sitka spruce and Douglas fir; whilst pine grows excellently on poor, sandy soil in the S. and E. which is of low agricultural value. On good sites the average rate of growth reaches about 170 cu. ft. per acre per annum for Douglas fir, 90 cu. ft. for Scots pine, 70 cu. ft. or less for oak.

**Forestry Commission.** Body formed in 1919 to promote the interests of forestry and develop afforestation in Great Britain. Developed from the Forestry sub-committee of the Reconstruction committee formed in 1918, it was set up as a result of the serious reduction in standing timber in Great Britain during the First Great War. It is a body corporate appointed every five years under the Forestry Acts of 1919-45, and consists of a chairman, nine commissioners (of whom all but one are unpaid), and four directors, one each for England, Scotland, and Wales, and one in charge of research. The aim of the commission is to replenish the supply of native timber by maintaining existing forests and by encouraging afforestation. The crown woods were transferred to it in 1924; by 1948 it owned 1,477,000 acres, of which 570,000 acres were planted. It also advises and makes grants or loans to local authorities and private landowners for the purpose of afforestation, and has power to take over the management of woodlands which it considers to be unsatisfactorily managed.

Expenses are met from a forestry fund, derived partly from a Treasury vote and partly from profits on the sale of timber and lands; expenditure for the financial year 1947-48 was £6,632,000. The Forestry Act of 1945 placed the commission under the control of the minister of

Agriculture and the secretary of state for Scotland (but not of their departments); transferred power to acquire land from the commission to the Agricultural commissioners; and allocated to the commission £20,000,000 to enable it to carry out afforestation involving the employment of 13,000 men and the planting (or replanting) of 365,000 acres, as the first part of a five-year plan.

**Forestry Corps.** Unit of the British army during the First Great War. To secure an adequate supply of timber for war purposes lumber units were formed in Canada, the first draft reaching England in April, 1916. The corps was formed from these battalions in Oct. and eventually numbered 18,000. In the Second Great War a forestry unit from Newfoundland was working in Great Britain in Nov., 1939. There was no distinct forestry corps but the work was performed by battalions or companies of specialists from Canada, Bermuda, Honduras, the Pioneer Corps, and Royal Engineers. There was also a forestry section of the Women's Land Army.

**Forez, MONTS DU.** Wooded range of mts. in the dept of Loire, France. They lie in the W. of the dept., and divide the basins of the Allier and the Loire. The loftiest summit is Pierre-sur-Haute, 5,380 ft. The range is also known as the Monts de la Madeleine and the Bois Noirs.

**Forfar.** Parl., royal, and mun. burgh, and the county town of Angus, Scotland. It stands in the



Forfar arms

valley of Strathmore, 12 m. N. of Dundee, and is a railway junction. The burgh's chief edifices are the county buildings, town hall, court house, and Meffan Institute. A public hall and a park were given by Peter Reid, a merchant here. The chief industries are the manufacture of linen and jute; others are bleaching and rope-making. The burgh is governed by a provost and council, and the corporation owns the gas and water supplies.

Forfar was a royal residence of Malcolm Canmore, whose castle on a hill of the N. of the town was taken and destroyed by Bruce in 1308; its site is marked by a cross erected in 1648. It was made a burgh in the 13th century. Forfar is one of the five Montrose

burghs which jointly return a member to parliament. Market days, Mon. and Fri. Pop. 11,032.

**Forfarshire.** This Scottish county has been officially known since 1928 as Angus (*q.v.*).

**Forfeiture** (late Lat. *foris factum*, something done outside). Deprivation of lands, goods, or other property, usually in consequence of a sentence passed by a court of law, or some breach of the law. In English law a person convicted of felony, treason, *felo de se*, and certain other offences, including striking a judge, forfeited all his lands and goods to the crown. This was abolished by the Forfeiture Act, 1870. At common law, also, an illegal conveyance of land, *e.g.* to an alien, before the Naturalisation Act, 1870, or to a corporation in mortmain, was similarly punished.

Leases frequently provide that the landlord may re-enter the premises and forfeit the lease if the tenant fails to carry out his obligations—*e.g.* to pay the rent or keep the premises in repair. The court will usually prevent the landlord from enforcing forfeiture if the tenant makes good his default. In the case of failure to pay rent the tenant may apply to the court for relief within six months of the landlord obtaining judgement. For breaches of other covenants, except where forfeiture is on the ground that the tenant has become bankrupt or his interest has been taken in execution, the landlord cannot forfeit unless he has served a notice. By the Leasehold Property (Repairs) Act, 1938, which applies to the leases for 21 years or more of a house of rateable value of £100 or less, if the landlord more than 5 years from the end of the lease and with a view to the forfeiture of the lease serves a notice on the tenant to carry out repairs, the tenant may serve a counter notice, then no proceedings can be taken without leave of the court.

**Forge** (Lat. *fabrica*, workshop). In metallurgy, term with a wide meaning. It covers the simple hearth of the blacksmith, early furnaces such as the Catalan forge (*q.v.*), in which malleable iron was produced in Europe for a long period, and the modern extensive plant comprising furnaces, cranes,

hammers, rolling mills, presses, engines, or motors and boilers, which make up an iron-manufacturing works. It always relates, however, to the working of metals from a crude or semi-manufactured form, to a higher order, as distinguished from melting and casting. See Iron; Steel.

**Forgery** (Lat. *fabricari*, to frame). English law term for making or altering a written instrument which purports to be valid with intent to defraud (or in some cases to deceive). The notion that forgery always consists in signing a false name, or imitating somebody's signature, is wrong. Thus, to alter the date or amount on a cheque, account, or receipt, though the signature is genuine, is forgery, if the alteration be made with intent to defraud. On the other hand, merely to subscribe a false name on a note or cheque may not be forgery at all if there is no fraudulent intent. The law on the subject is dealt with by the Forgery Act, 1913.

**Forget-Me-Not.** Hardy perennial plant of the family Boraginaceae, genus *Myosotis*. Natives of



Forget-Me-Not. Leaves and flowers of the perennial plant

Great Britain, their height is from 7 ins. to 18 ins.; the flowers are blue and yellow. Several cultivated varieties are raised from seed planted out of doors in spring, and transplanted to their permanent positions in the autumn when they will flower in the spring and summer of the following and successive years. The best position is a moist

corner of the rock garden. The well-known blue variety is *M. palustris* which, though found naturally by the sides of streams, will thrive equally well in the garden as an edging, or in small beds or borders in moist peaty soil. A rarer natural species is *M. palustris alba*, which has white flowers.

**Forging.** Production of articles of iron or steel or other metal by hammering, pressing, rolling, or otherwise shaping the metal while heated but not in a molten condition. It is distinguished from casting by the fact that the metal is never raised to a temperature sufficiently high to melt it.

It is almost certainly the most ancient branch of the whole art of metallurgy, and was first practised by primitive man in shaping



pieces of native copper into rough weapons or implements. It depends upon the property which metals possess, some more eminently than others, according to which they "flow" under pressure while in the solid state. In its broad sense it embraces all the operations of shingling, cogging, and rolling by which "merchant" bars and plates are produced; the works in which such operations are carried out, while frequently styled rolling mills today, were originally termed forges, and the term is still largely retained.

These processes involve, first, the proper heating of the crude mass of metal to the requisite temperature; and, secondly, the use of tools specially adapted to impart the desired shape to the heated mass of metal. They are modified more or less according to the metal which is to be operated upon—iron, steel, copper, magnesium, aluminium, gold, silver, or alloys of these. The forging proper will nearly always begin with a reducing operation, "drawing down" a piece of metal to a smaller size.

Thus, in the production of an ordinary stonecutter's chisel, a round or a six-sided bar of steel of the desired thickness will be taken. The end of this bar will be heated in the smith's fire, and as soon as the right temperature has been reached the bar will be withdrawn, the heated end laid on the smith's anvil and hammered out—drawn down—until it has assumed the required chisel shape. If the chisel is a small one the whole operation so far may be done by the smith himself with his hand hammer.

#### Principal Operations of Forging

Otherwise the chisel will be finished by the use of a "swage," which in this case will be a flat-faced tool held in a handle made of twisted iron rod. The smith will lay the face of this swage on the end of the chisel and his helper or striker will strike it with his sledge-hammer, thus producing a finished surface of the desired shape, free from hammer marks. The end of the bar will then be notched by means of a smith's chisel at a distance up the bar corresponding to the length of the chisel desired, and the piece broken off. It is not yet finished, however; it will be desired to flatten out and round off the blunt end of the chisel. That end is therefore heated again, the chisel is then withdrawn, and the end hammered or knocked upon the anvil, when it will be broadened out more or less, as required. This operation is called "upsetting." The production of this simple article

thus illustrates four principal operations of forging—heating, drawing down, cutting off, and upsetting.

Other principal operations are bending, holing, and welding. In the production of a great propeller or engine shaft which may weigh 100 tons, or of a 100-ton gun, the operations are essentially the same.

#### Drop or Die Forging

In the modern system of drop or die forging, the heated piece of metal is pressed into a die, a hardened steel form, by a hammer falling or dropping repeatedly upon the die. The hammer is worked mechanically, its weight amounting in large machines to 3,000 lb. Many of the parts of motor-cars, motor-cycles, bicycles, and other articles in iron, steel, and non-ferrous metals are made by drop forging. Bolts and nuts, screw blanks and rivets are now made chiefly by machine forging, in which the machine takes a heated bar of iron or steel, cuts off a definite length, shapes the latter to the form required, and ejects it automatically. See Casting; Metallurgy; Welding.

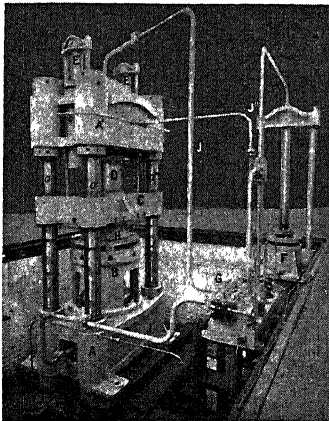
**Forging Press.** Instrument used in metallurgy. The increasing sizes and complexity of articles in malleable iron and steel required in

engineering particularly, such as heavy flanged plates, cranks, and crank shafts, began to make their production by means of the steam-hammer difficult. Attention was therefore directed to the hydraulic press as likely to prove a more effective appliance, and such objects are now largely produced by its aid. Very powerful presses, capable of exerting a total pressure of 10,000 tons, have been built for forging purposes. The illustration shows a press of this character with its pumps and control valves, adapted as it stands for the production of flanged wheels and other heavy flanged plates by direct pressure.

**Forisfamilialion** (Lat. *foris*, outside; *familia*, family). In Scots law, the alienation of a child from his father and exclusion from further inheritance, by marriage, by provision made for him by his parents in ante-nuptial settlement or other portioning, or by his own renunciation of his legal right to legitim (*q.v.*). The custom is derived from the Roman law of emancipation of a son from his father's power by fictitious sale and manumission, by imperial rescript, or by formal declaration, after which the son became independent (*sui juris*), quitted the family to which he formerly belonged, and, as a general rule, lost the rights of agnation.

**Fork** (Lat. *furca*). Instrument for holding or lifting. It consists of a handle, terminating in two or more prongs. An example is the table-fork of silver or other metal. A tuning fork (*q.v.*) is a two-pronged steel instrument which when struck gives a fixed and definite note, used to determine musical pitch. By analogy the word is used for something (*e.g.* a road) which divides into two.

The farm implement of this name has a wooden handle and two or more steel tines. The two-tined kind, when large, is known as a pitchfork, used for loading hay or grain. Short, stout, emptying forks, of similar pattern, serve for unloading, while turning and collecting forks are still smaller, but with the same number of tines. Digging forks possess three to five tines, which may be round, square, or flat. Additional leverage is given by a sharply bent neck, and a short handle is preferred. Dung forks, for dealing with farmyard manure and litter, usually have three or four curved tines of circular section. Caving, cocking, or pooking forks, for collecting and loading short material, are somewhat similar, but the tines are long and wide apart, while they are continued backwards above the neck



Forging Press. A, A'. Base and head connected by columns, a, a', a''. B. Stand attached to base and to upper part of which tables and dies are attached. C. Inverted platen attached to ram, D, which works up and down under hydraulic pressure. Platen slides up and down columns. E, E'. Retractor rams which pull up the platen after each downward stroke. F. Intensifier which puts final extra pressure on ram, D, and articles being made. G. Hydraulic pumps working rams. H. Flanged tire of small railway truck wheel receiving finishing press. Ram, D, may make from 30 to 80 strokes per minute, each pressing article a little nearer final shape. J, J', J''. Hydraulic connections conveying pressure to the various rams



and connected by a cross-bar, so as to prevent the forked-up stuff from falling off again.

**Forli.** Province of Emilia, N.E. Italy. Bounded E. by the Adriatic Sea and N. by the prov. of Ravenna, its area is 730 sq. m. The surface is flat and low-lying, and the soil fertile. The chief products are wine, grain, silk, and sulphur. Besides Forli, Rimini is in this prov. Pop. 421,770.

**Forli.** City of Italy, the ancient Forum Livii. The capital of the prov. of Forli, it stands in a fertile plain, intersected by the rivers Montone and Ronco, 40 m. S.E. of Bologna by the main rly. from Bologna to Brindisi. A walled town, it contains a cathedral (re-built), a citadel, 1361, utilised as a jail, a lyceum, technical institute, municipal art gallery, and town hall. The churches contain pictures and frescoes by local masters. A thriving trade is carried on in cattle, cereals, wine, silk, and hemp, while the manufactures include furniture, earthenware, machinery, headgear, shoes, and silk goods. Founded about 200 B.C., in the Middle Ages it was part of the exarchate of Ravenna. It experienced many vicissitudes during the quarrels of the Guelphs and the Ghibellines, and fell to the papacy in 1504. It suffered little damage in the Second Great War, British troops of the 8th army occupying it Nov. 9, 1944, after the Germans had withdrawn. Pop. 65,683.

**Forlorn Hope** (A.S. *fore-lioran*, to send forward, *hauife*, a troop). Military expression once signifying troops sent forward. The implication that they are to carry out a specially dangerous enterprise is a comparatively modern use of the expression. The French, Dutch, and German equivalents are *enfants perdus*, lost children, *verloren hoop*, lost troop, and *verloren Posten*, lost post. Cromwell issued the first campaign medal to the forlorn hope, or skirmishers, of the New Model Army; it was of pewter and was worn on the hat. In hunting phraseology, a hound that follows the chase in front of the rest of the pack is referred to as a forlorn or forloyne hound. In ordinary language forlorn hope is used of any hopeless undertaking, hope being erroneously identified with hope meaning expectation, a word of entirely different etymology.

**Form** (Lat. *forma*). Word literally meaning shape. It denotes the manner in which the matter or parts of a whole are combined. Thus, a table or a chair may be

made of pieces of wood, but the form of a table differs from that of a chair in the arrangement of the materials. Aristotle lays down four causes or principles of being—the material, the formal, the efficient, and the final. The three last-named on examination will be found to run into one another, leaving only the opposition of Form and Matter. Matter is possibility or potentiality (*dynamis*) which becomes actuality (*energeia*) by its conversion from indeterminateness into something definite. As an adaptation of the Platonic idea, form is the realization of the ideal, e.g. of the perfect table that a carpenter has in mind. See Matter.

**Form.** In music, the plan of construction, or the arrangement of phrases, sections, and movements. There is no limit to the possible varieties of musical form, but a few outstanding classes may be named. Binary form has two main divisions, as exemplified in the old air Barbara Allen; ternary form has three divisions, as in Charlie is My Darling. From these two germs most of the larger specific forms have been evolved, such as the rondo, the sonata, and all their derivatives. The fugue is essentially a contrapuntal movement of continuity, but it has an underlying basis of sectional form.

Many compositions bearing other generic names are also referable to these forms; e.g. many songs and short instrumental pieces are in simple ternary form, called also primary, song, or lied form; many marches are in rondo form; the minuet and trio, in a suite, or symphony, are each in either binary or ternary forms, while together, with the recapitulation of the minuet, they constitute a larger ternary form. See Minuet; Suite; Symphony; Trio.

**Formalin** OR FORMALDEHYDE (HCOH). Pungent gaseous compound first prepared in 1867 by Hofmann by passing methyl alcohol vapour and air over a heated platinum spiral. A 38–41 p.c. solution of formaldehyde is known as formalin, and is the form in which the gas is obtainable in commerce. A current of air drawn by an aspirator is passed over methyl alcohol and in contact with silver gauze, formaldehyde being formed. The gas is made to pass through a series of receivers containing water, until the water is saturated with the gas. Formalin is employed as a preservative and antiseptic. Combined with ammonia, formaldehyde yields hexa-methylene-tetramine, which, under the

name of hexamine, is used as an internal urinary antiseptic.

A recent discovery in chemistry is the production of formaldehyde by the action of light upon water, in imitation of the natural process by which it is created by a plant through the agency of chlorophyll. The latter, under the influence of sunlight, extracts carbonic acid gas from the air and combines it with water to form formaldehyde and sugar. In the laboratory, carbonic acid and water under the influence of ultra violet rays are made to produce a similar result. The process is known as photo-synthesis. By using a coloured water, pure formaldehyde was obtained without sugar by Professor Baly of Liverpool. Formaldehyde can be produced industrially by the direct catalytic union of carbon monoxide and hydrogen or by the oxidation of synthetic methanol.

Formalin is a powerful caustic; when mixed with ten times its volume of water it may be used for removing corns. A 30 p.c. solution may be used for treating ringworm of the scalp, and a solution of 1 in 500 as a mouth-wash. Formalin is not much used in surgery as an antiseptic, as it tends to retard healing. It is a powerful disinfectant and has the advantage that it does not injure coloured fabrics. Formaldehyde is widely used in plastics, condensing with phenol to give bakelite and with urea and related compounds to give amino-plastics.

**Formalism.** In philosophy, the tendency to consider mere form or externalities as the only valuable part of anything. Thus, the adherence to cut-and-dried rules, like those of formal logic, is formalism. The same applies to the rules of composition in sculpture or painting. The term is specially used of strict adherence to religious forms and dogmas characterised by the absence of a genuine religious feeling. Formalism is rather the reduction of such forms and dogmas to a written system.

**Forman, SIMON** (1552–1611). English astrologer and quack doctor. Born at Quidhampton, Hampshire, Dec. 30, 1552, he entered Magdalen College, Oxford, as a poor scholar, 1573. After experience as an usher in small country schools he claimed mira-



Simon Forman,  
English astrologer

culous powers, and in 1580 professed to be able to cure diseases. He studied medicine and astrology in Holland, and in 1583 started practice in London, wrote treatises on mathematics and medicine, and began to seek the philosopher's stone. Though frequently arrested, he worked among the poor in plague-stricken areas and obtained a large and far less honourable practice among court ladies; e.g. his aid was sought by Lady Essex to alienate the love of her husband and influence the affection in her favour of Somerset. Cambridge granted him a licence to practise medicine in 1603.

Richard Nicolas, in Overbury's Vision, 1616, thus refers to him:

Forman was that fiend in human shape  
That by his art did act the devil's ape

His philtres are alluded to in Jonson's Epicoene, and his career suggested much in Jonson's play, The Alchemist. He died Sept. 11, 1611, and was buried in S. Mary's church, Lambeth. His MSS. came into the possession of Elias Ashmole. A diary, 1564-1602, was published in 1849.

**Formation.** In geology, an old term used to denote a group of strata or rock-beds. They are distinguished by common lithological characters, such as the Upper Greensand formation (sandstone) and Gault (clay). Modern divisions of stratified rocks are based on fossils enclosed, which often prove strata of different lithological aspect to be of same age. For these divisions "stage" names are applied. e.g. Selbornian stage, which includes both Upper Greensand and Gault formations.

**Formby.** Urban district, market town, and watering-place of Lancashire, England. It is 7 m. S.W. of Southport, and has a railway station. Formby is really a residential suburb of Liverpool. Near are the Altcar Flats, on which the Waterloo Cup is decided. Pop. 7,957.

**Formby, GEORGE** (d. 1921). British comedian. Born James Booth, he was a native of Ashton-under-Lyne, and first appeared on the London music hall stage at the Royal Albert, Canning Town, in 1902. He achieved outstanding success in variety at the Tivoli by his simple Lancashire humour, his wheezy voice (long thought to be assumed, but actually due to painful pulmonary weakness which he turned to good account with high courage), and his burlesque of the familiar light comedian. He appeared in pantomime and revue, and among the songs he popular-

ized was the famous I was Standing at the Corner of the Street. He died at Warrington, Feb. 8, 1921.

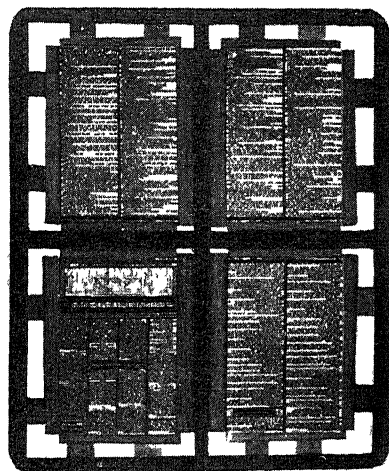
His son George, who adopted the same surname, was born May 26, 1904. He became a jockey, but abandoned that career for the stage, playing first under the name George Hoy. From his first film in 1934 he was a popular comedian, and his later pictures included It's in the Air; Trouble Brewing; Keep Your Seats, Please. During the Second Great War he and his wife Beryl devoted themselves to entertaining British troops overseas, sometimes in theatres of war not visited by other artists.

**Forme.** In printing, a page or number of pages of type, or stereotypes, arranged or "imposed" for printing and secured or "locked up" in a metal frame called a chase. See Printing.

**Formentera.** One of the Balearic Islands, in the W. Mediterranean Sea, belonging to Spain. It is the smallest and most southerly of the group, and lies 7 m. S. of Ibiza. Area 37 sq. m. The fertile soil yields abundant wheat. Fishing and salt-working are engaged in.

**Formia.** Town of Italy, in the prov. of Naples, until recently called Mola di Gaeta. Situated on the N. side of the Gulf of Gaeta, 48 m. by rly. W.N.W. of Caserta, it is a seaside resort. A Volscian town, known as Formiae, it stood on the Appian Way and was a residential district for wealthy Romans, remains of whose villas stud the coast. Here Cicero lived, and met his death, near his villa, Dec. 7, 43 B.C. The town has a little trade in olive oil and earthenware, and the surrounding districts yield an abundance of fruit. During the Second Great War, little damage was done, though the Germans looted the choir and sacristy of the church of S. Erasmo, and the best objects in the museum were removed to Naples, where they were destroyed. American troops of the 5th army captured Formia May 18, 1944.

**Formic Acid** (Lat. *formica*, ant). The lowest in the important series of fatty acids. Its chemical formula is  $\text{CH}_2\text{O}_2$ . It was first obtained by John Ray in 1670 by



Forme. Four pages of type locked up in a chase, making a forme ready for printing

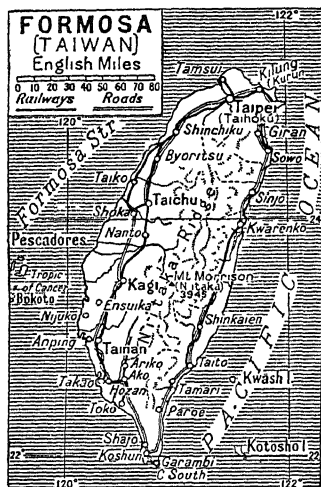
distilling red ants with water, his observations being printed in the Philosophical Transactions of that year. Formic acid occurs in other animal and vegetable substances, but is now made by (1) heating to 60° C. in a retort a mixture of sugar, water, manganese peroxide, and sulphuric acid; (2) heating equal parts of anhydrous glycerine with oxalic acid and distilling the product. It has been used in the treatment of rheumatism, as it was observed that those liable to bee stings often found relief from rheumatic pain.

**Formication.** Sensation of insects crawling under the skin, a disorder of the sensory nerves resulting from prolonged intake of certain toxic substances, e.g. cocaine.

**Formicivora** (Lat. *formica*, ant; *vorare*, to devour). Genus of passeriform birds of the family Pittidae. They are long-legged birds and are widely distributed geographically.

**Formigny, BATTLE OF.** Fought between the English and the French, April 15, 1450. To strengthen the English cause in France a force under Sir Thomas Kyriel was sent to Cherbourg. About 2,500 strong, it was joined in Normandy by another 1,000 men, and this army, having taken Valognes, moved to Formigny, near Bayeux. There it was met by a French force and was routed.

**Formosa** or **TAIWAN.** Island province of China, off the S.E. coast. Formosa was Chinese territory from 1683 until 1895, when after the Sino-Japanese war it was ceded to Japan. The island proved



Formosa. Map of the island province of China

a valuable base for subsequent Japanese operations against China, and, in Dec., 1941, against the neighbouring Philippines. Its restitution to China was one of the decisions of the Anglo-Sino-American conference in Cairo, Nov., 1943. Military objectives were frequently bombed by Allied aircraft during 1944-45, and the formal surrender of Japanese forces in Formosa was signed at Nanking on Sept. 9, 1945.

An island of wonderful fertility and great natural beauty, it is divided sharply into two nearly equal portions. The W. side, facing China, consists of highly cultivated plains; the E., of lofty forest-clad mt. ranges, which extend to the E. coast, where the island faces the open Pacific with steep, perpendicular cliffs, rising in places to 6,000 ft. The capital is Taipei (*q.v.*). Other important towns are the ports of Kilung, Taitung, Anping, and Lukang; also Tainan and Chiayi. As the centre of the island is mountainous, the main rlys. run along the coast. There is a network of excellent highways. Chief products are 90 p.c. of the world's camphor, sugar, tobacco, salt, coal, and gold. The annual yield of sugar is 17,000,000 tons, the fourth largest of any country.

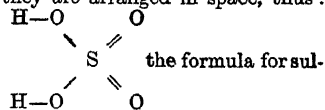
Between Formosa and Fukien on the mainland is a group of 21 small but strategically important islands known as the Pescadores (or Bokoto).

From 1895 to 1945 this group was also under the Japanese, who established a naval base at Mako and also air bases, but it is now part of the prov. of Formosa. Area (including the Pescadores), 13,889 sq. m.; pop. 6,500,000, of whom 94 p.c. are Chinese, the remainder aboriginal hill tribes.

**Formosa.** Territory of Argentina, in the N.E. of the republic. It lies between the rivers Pilcomayo and Bermejo, with Paraguay on the N. and E., the prov. of Chaco on the S. and the prov. of Salta on the W. It includes part of the Gran Chaco. The interior contains forests and swamps, abounding in game. Area, 29,143 sq. m. The capital is Formosa, a port on the river Paraguay, a centre for agricultural produce, cattle, tobacco, and sugar. Indians inhabit the interior.

**Formosa Strait.** Channel separating the island of Formosa from China. About 150 m. wide, it contains the Pescadores Islands, the largest of which is Hokoto.

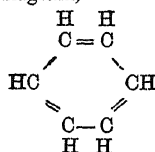
**Formula.** In chemistry, a contraction showing what elements and how many atoms of each are contained in a molecule of a compound. Thus  $H_2O$ , the formula for water, shows that a molecule of water contains two atoms of hydrogen and one atom of oxygen. More complicated formulae show how the various atoms in a molecule are linked together and how they are arranged in space, thus:



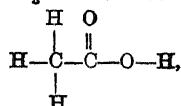
phuric acid, shows not the actual arrangement in space, for this is usually not possible on a flat surface, but how the atoms are linked together. The formula for a molecule of common salt is  $NaCl$ , but crystals of common salt are not assemblies of molecules; they are groups of atoms or ions in which each sodium atom,  $Na$ , is surrounded and equally attracted by six chlorine atoms,  $Cl$ , and each chlorine atom is surrounded by

and equally attracted by six sodium atoms.

The molecule of benzene has the formula  $C_6H_6$  and is usually shown by this diagram,



This convenient formula is not strictly correct, as the molecule is a perfectly symmetrical hexagon and there is no physical evidence of alternate double and single bonds. The formula for acetic acid may be written as  $C_2H_4O_2$  or as  $CH_3COOH$  or as



but the molecule is not in reality a flat one. It is impossible to show by such formulae the structure of complicated compounds, and such structural formulae should be regarded as merely rough guides.

**Forres.** Royal burgh and market town of Morayshire, Scotland. It stands on the river Findhorn,



Forres arms

near the Moray Firth, 12 m. S.W. of Elgin. The principal buildings are the town hall, Falconer Museum, Anderson's Institution, and Municipal Buildings. An ancient monolith, named Sueno's stone, is said to have been placed here early in the 10th century. On Castle Hill was a royal residence in the 12th century. Woollen goods are manufactured. Forres is situated in a sheltered position at the foot of the Cluny Hills, and near is the Cluny Hill hydropathic. Pop. 4,169.

**Forster, ALBERT** (b. 1902). Danzig politician. He became the chief Nazi official of the Danzig district about 1930, as a member of the association of office workers in the German Labour Front. He then edited the Danziger Vorposten, urging a pro-Nazi policy. Raised to the Prussian state council, he was on Aug. 24, 1939, appointed by Hitler head of the Danzig state just before its incorporation by Germany. In the Second Great War he was known as gauleiter of Danzig and West Prussia, being responsible for the expulsion of Poles from territory



Formosa. Natives of Karenka on the beach. They are of Malay origin and are half savage

deemed to be German. Following the defeat of Germany he was captured at Hamburg by the 53rd Welsh div. late in May, 1945, and was handed over to the Polish government in Aug., 1946.

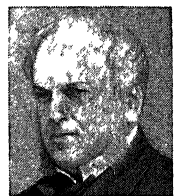
**Forster, EDWARD MORGAN** (b. 1879). British novelist. Born Jan. 1, 1879, and educated at



E. M. Forster,  
British novelist

Tonbridge and King's College, Cambridge, he published his first novel, *Where Angels Fear to Tread*, in 1905. Then in *The Longest Journey*, 1907; *A Room with a View*, 1908; and *Howard's End* 1910, he dealt with the interaction of two types of character, those who live by convention and those who live by instinct. His masterpiece, *A Passage to India*, 1924, again emphasising the importance of personal relations, was awarded the *Femina Vie Heureuse* and James Tait Black Memorial prizes. In 1927 he was Clark lecturer at Cambridge, when he dealt with *Aspects of the Novel*, and in 1937 he published a collection of essays, *Abinger Harvest*. His biography of G. L. L. Dickinson, 1934, was remarkable in that he made the undramatic life story of a man of letters and ideas intensely interesting. As a short story writer Forster occupied a high place, his best-known collections being *The Celestial Omnibus*, and *The Eternal Moment*. His quiet, clear speech and his wit made him an acceptable speaker and broadcaster. *Consult The Writings of E. M. Forster*, R. Macaulay, 1938; E. M. Forster, L. Trilling, 1944.

**Forster, JOHN** (1812-76). A British historian and biographer. Born at Newcastle, April 2, 1812,



John Forster,  
British historian  
After C. E. Perugini

and educated at Newcastle grammar school and University College, London, he became, in 1833, the literary and dramatic critic of the *Examiner*, and edited the *Daily News* in 1846. During 1847-55 he edited the *Examiner*, resigning on his appointment as secretary to the commissioners of lunacy. From 1861 to 1872 he was one of the commissioners. He died Feb. 1, 1876.

Forster is best known for his *Life and Times of Oliver Goldsmith*, 1848; and *Life of Dickens* (of whom he was the intimate friend and correspondent for over 30 years) 1872-74. He also wrote *Lives of the Statesmen of the Commonwealth*, 1836-39; *Arrest of the Five Members*, 1860; *Life of Sir John Eliot*, 1864; and vol. i of a *Life of Swift*, 1875. His collection of MSS., books, and pictures forms the Forster bequest at the S. Kensington Museum.

**Forster, WILLIAM EDWARD** (1818-86). British politician. Born at Bradpole, Dorset, July 11, 1818.

his parents were Quakers, and he was educated at a Quaker school at Tottenham. In Bradford he became a successful woollen manufacturer. He found time also for public work; writing and lecturing made him known, and in 1861 he was returned as Liberal M.P. for Bradford. He retained the seat throughout his life.

In 1865 Forster joined the Liberal ministry as under-secretary for the colonies, but he was soon in opposition. In 1868 he became vice-president of the council in Gladstone's first ministry. It fell to him to frame and introduce the important Education Act of 1870. He remained in office until 1874, and in 1880 returned to the difficult position of chief secretary for Ireland. In 1882 he resigned, as Gladstone released the political prisoners from Kilmainham, and it was not surprising when he declared against Home Rule. On April 6, 1886, he died at his London residence. *Consult* Life, Sir T. Wemyss Reid, 1888.

**Forsterite**. The magnesian end-member of the olivine series of minerals; magnesium silicate ( $Mg_2SiO_4$ ) in light-coloured orthorhombic crystals. It occurs in volcanic rocks or as a contact mineral in dolomite altered by igneous intrusion. *See* Olivine.

**Forsyte Saga, THE**. Sequence of novels by John Galsworthy. The original "saga" comprised three long stories: *The Man of Property* (1906), *In Chancery* (1920), and *To Let* (1921), with two linking short stories. These, reissued in one vol., 1922, as *The Forsyte Saga*, depict very fully the history of a large London family of the wealthy and apparently secure



W. E. Forster,  
British politician

middle-class between the years 1886 and 1920, which has considerable value as a social document apart from its merit as a study of human motives. The history was extended to later years in three further novels: *The White Monkey* (1924), *The Silver Spoon* (1926), and *Swan Song* (1928), which were reissued in 1929, again with two short stories, as *A Modern Comedy*. Even then, though the Forsyte story was completed, some of the characters were carried over into other books, viz. *Maid in Waiting*, 1931, *Flowering Wilderness*, 1932, *Over the River*, 1933. There were also several disconnected short stories about the Forsytes, many of them being collected into the volumes *On Forsyte 'Change* (1930) and *Forsytes, Pendycyes and Others* (1935). The success of the original Saga, a new experiment in publishing, led directly to a fashion for "omnibus" volumes of all kinds containing three or more separate books. *See* Galsworthy, John; Omnibus Books.

**Forsythia**. Genus of shrubs of the family Oleaceae. Natives of Japan and China, they have smooth, simple, or trefoil leaves, and scattered yellow flowers, abundantly produced in early spring, which makes the two species, *F. suspensa* and *F. viridissima*, favourites in European gardens. The genus is named after William Forsyth, an 18th century gardener.

**Fort** (Lat. *fortis*, strong). Fortified place of small size, surrounded by a ditch, moat, rampart, stockade, or other means of defence, and garrisoned with a small body of troops. Fort is a diminutive of fortress and sometimes refers to a small castle. The term was applied to trading posts set up by Europeans in N. America, Africa, and India; some rough shelter and protection was thrown up, and the fort served as a storehouse and rendezvous for the traders, and, in attacks, as a refuge. During the Franco-British wars in India in the 18th century the existing forts were strengthened and new ones erected. Forts are still used as defence points on the N.W. frontier of India. Some leading examples in both N. America and India developed into towns and retained the prefix, e.g. Fort Duquesne. In its modern sense, fort means part of a general system of fortifications. *See* Fortification; Fortress.

**Fort, PAUL** (b. 1872). French poet. Born at Reims, Feb. 1, 1872, he settled in Paris, where he

founded in 1890 the *Théâtre des Arts* for modern plays, e.g. by Verlaine and Maeterlinck. Fort also edited the *Symbolist review*, *Vers et Prose*. The first volume of his *Ballades Françaises* appeared in 1897, and was followed by over 30 more, under the same title, establishing Fort's reputation as one of the outstanding contemporary French poets. He is influenced to some extent by Laforgue, but intensely individual, using rhythmic prose as his medium. He also wrote plays, and a stimulating *Histoire de la Poésie Française depuis 1850* was published in 1926. *Pron.* For.

**Fortaleza.** The capital of Ceara, Brazil, is usually known by the same name as the state. *See* Ceara.

**Fort Augustus.** Parish and village of Inverness-shire, Scotland. It is finely situated at the head of Loch Ness, on the Caledonian Canal, and is connected with Spean Bridge, 24 m. S., by a branch railway line. The fort, built originally in 1716 and enlarged in 1730, was taken by the Jacobites in 1745, and recaptured a year later by William Augustus, duke of Cumberland, in whose honour it was named. Purchased by Lord Lovat in 1857, it was presented by him in 1876, to the Benedictines, who transformed it into a monastery with college, hospital, and scriptorium, which in 1882 was raised to the rank of an abbey. Pop. 600.

**Fort Bayard.** Town and port of Kwangchowwan, S. China. Situated on the N. shore of Mandarin Bay, the town was formerly the administrative centre of that portion of French Indo-China leased from China. This territory was restored to China in Feb., 1943, and occupied by Japanese forces in the same month. There is an aerodrome near the town, which has steamer communication with Hong Kong, Macao, and Canton. Pop. 20,000.

**Fort Beaufort.** Town of Cape Province, S. Africa. It is on the Kat river, 63 m. by rly. W.N.W. of King William's Town, and is an important ostrich farming centre. It is also the headquarters of a district with pop. 17,374.

**Fort Belvedere.** Royal estate in Berkshire, England. Between Ascot and Sunningdale, 6 m. S. of Windsor, Fort Belvedere was completed in 1746 as a look-out post for troops returned from quelling the Jacobite rebellion and encamped in Windsor Great Park. In 1750 it became the official residence of the duke of Cumber-

land (q.v.) in his capacity as Ranger of Windsor Park. The duke mounted on its battlements the battery of 4-pdr. guns which had been used at Culloden; these guns are still at the fort and until Victorian times fired royal salutes. Fort Belvedere was converted into a country house by George IV. In 1932 it became the country seat of the prince of Wales, who as Edward VIII here signed his instrument of abdication on Dec. 11, 1936.

**Fort Capuzzo.** This Libyan fortress of the Second Great War is noticed under Capuzzo.

**Fort-de-France.** Town of Martinique, French W. Indies, formerly known as Fort Royal. On the W. coast, 15 m. S.E. of St. Pierre, it is the capital and chief commercial centre of the colony. Its commodious harbour is fortified, and it has an arsenal, law and commercial colleges, a library, and several hospitals. In the chief square there is a statue of the Empress Josephine. In Aug., 1891, the town was laid in ruins by a cyclone. Pop. 52,051.

**Fort Donelson, BATTLE OF.** Federal victory in the American Civil War, Feb., 1862. Fort Donelson and Fort Henry, situated 12 m. apart on the Kentucky-Tennessee border, were the two most important defences of the West, occupied by the Confederates in 1861. Grant immediately recognized the necessity of capturing them, and succeeded in seizing Fort Henry, although most of its defenders had escaped to Fort Donelson.

Moving against the latter with a combined naval and military force, Grant received a serious check, and on Feb. 15 the Confederates made an attempt to retreat to Nashville, but were stopped by Grant. The following day Buckner, in command of the fortress, asked for an armistice in which to settle terms of capitulation. Grant demanded unconditional and immediate surrender, to which Buckner agreed. This reply of the Federal general and the play upon the initials of his Christian names, U. S., gave him the sobriquet of Unconditional Surrender Grant.

**Fort Duquesne.** Eighteenth century stronghold in Pennsylvania, at the junction of the Monongahela and Allegheny rivers. During the French and English disputes about the sovereignty of the land W. of the Alleghenies, George Washington recommended the spot as a suitable site for a fort, and in 1754 the English began to construct one. The French

drove them away and themselves completed the work, calling it Fort Duquesne, after the French governor of that name. Attempts by Washington, and in 1755 by General Braddock, failed to recover it; but in 1758 General John Miles succeeded. He arrived there to find that it had been abandoned and destroyed. The English then began to build Fort Pitt, which grew into Pittsburgh (q.v.).

**Forté.** Italian term used in music, meaning strong or loud. It is sometimes represented by the abbreviations *for.*, or *f.* Its superlative, meaning very loud, is *fortissimo*, shortened to *ff* or *fff*, or very rarely *ffff*. *See* Musical Terms.

**Fort Erie.** Town of Ontario, Canada, on the opposite side of the Niagara river from Buffalo, U.S.A. It is 100 m. S. of Toronto by C.N.R., C.P.R., and other rlys. Abundant water power is used for industries, which include steelworks and aircraft factories. Pop. 6,595.

**Fortescue.** River of W. Australia. It rises in the Hammersley Range, flows in a N.W. course of 250 m., and discharges into the Indian Ocean in lat. 21° 10' S., a few miles below Cape Preston.

**Fortescue, SIR JOHN** (c. 1394-1476). English judge and writer. Though belonging to the Devon



Sir John Fortescue,  
English judge  
After W. Faithorne

family of that name, he was born at Norris, Somerset. He was educated at Exeter College, Oxford, and became a lawyer in London. In 1442 he was made chief justice of the king's bench, and he held the post until Henry VI lost his throne in 1461. He went abroad with Queen Margaret of Anjou in 1463, and was with her and her son Edward for some time, but in 1471 he was pardoned by Edward IV. Fortescue is best known by his writings. His treatise on the laws of England (*De Laudibus Legum Angliæ*) was published after his death, and several times since. He also wrote a book, the earliest of its kind, now known as *The Governance of England*. This was first published in 1714 as *The Difference Between an Absolute and a Limited Monarchy*, and under its other title, with an introduction by C. Plummer, in 1885.

**Fortescue, SIR JOHN WILLIAM** (1859-1933). British military historian. Born Dec. 28, 1859, a

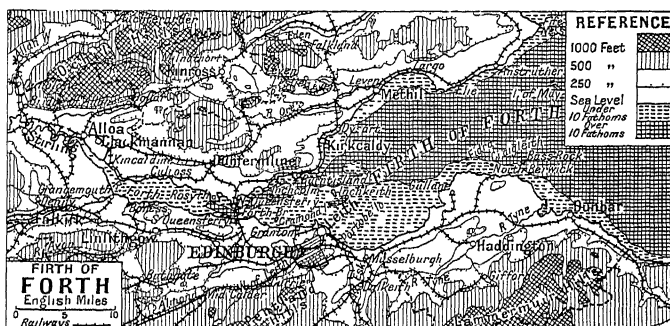
younger son of the 3rd Earl Fortescue, he was educated at Harrow and Trinity College, Cambridge. He was private secretary to the governor of New Zealand, but devoted much time to military history. In 1899 appeared the first volume of his *History of the British Army*; in all 13 volumes were needed to complete this monumental work in 1930. This is the most complete history of its kind, and particularly valuable for the 18th century. Fortescue was librarian at Windsor Castle, 1905-26. He also wrote a *History of the 17th Lancers*, 1895, and an animal study, *The Story of a Red Deer*, 1897. Lecturer on military subjects at the universities of Oxford, Cambridge, and London, he received the K.C.V.O., 1926. He died Oct. 22, 1933.

**Fort Garry.** A former post of the Hudson Bay Co., erected 1835, on the site of which Winnipeg (*g.v.*) grew up. In 1873 the city was incorporated under the latter name. Old Fort Garry Gate, a castellated gate at the end of Broadway, is all that remains of the fort. A mounted unit of the Canadian army known as the Fort Garry Horse distinguished itself at Cambrai, Nov. 20, 1917.

**Fort George.** Fortress of Inverness-shire, Scotland. It stands on Moray Firth, 12 m. N.E. of Inverness, and was erected after the rebellion of 1745 to accommodate 2,000 men, and improved in 1784. There is ferry communication with Fortrose on the opposite shore of the Firth.

**Forth.** A river of Scotland which, flowing into the North Sea, forms as its estuary the Firth of Forth. The meeting of the hill streams Duchray Water and Avonduh, near Aberfoyle, Perthshire, forms the Forth, which flows through Perthshire, Stirlingshire, and Clackmannanshire, mainly in an easterly direction. The total length as far as Alloa is about 53 m. Tidal to a point about 4 m. above Stirling, the river is navigable for 300-ton vessels as far as Alloa, for 100 tons to Stirling. Its chief tributaries are the rivers Teith and Devon and Allan Water. In the Carse of Stirling its course is extraordinarily sinuous, forming the so-called Links of Forth.

**Forth, FIRTH OF.** Name given to the estuary of the river Forth, on the E. coast of Scotland. The Firth begins at Alloa, and stretches to a line drawn S. from Fife Ness, being thus about 51 m. long and varying in width from one to 17 m. The chief islands are Inch-



Firth of Forth. Layered map showing the heights of the surrounding hills and depths of the estuary

keith, Inchcolm, Cramond, and the Bass Rock. Leith, Granton, Grangemouth, Alloa, Burntisland, and Methil are the chief harbours and fishing ports along both coasts. The Firth is spanned at Queensferry by the Forth (rly.) Bridge, and a swing road bridge at Kincardine-on-Forth, opened in 1936. A ferry service is maintained at Queensferry between Granton and Burntisland.

The Firth has great strategic importance. During the First Great War it was a base of the Grand Fleet; defences, forts, protective booms, etc., were constructed, and in the Firth off Inchkeith the German fleet surrendered, Nov., 1918. The first German air raid on Great Britain during the Second Great War occurred in daylight on Oct. 16, 1939, in this area, ships of the Royal Navy being attacked off Rosyth. R.A.F. aeroplanes engaged German aircraft over the mainland for the first time in this action. See Rosyth.

**Fort Hall.** Settlement in Kenya, E. Africa. It is situated between Nairobi and Mount Kenya, and is 4,500 ft. above sea level. A branch line from the Uganda rly. at Nairobi links it with Nanvuki.

**Forth Bridge.** Railway bridge in Scotland, begun in 1882 and opened for traffic in 1890. By its construction across the Firth of Forth, from S. Queensferry to N. Queensferry, a long detour of the rly. westward was obviated and direct connexion between Edinburgh and the N. side of the Firth established, while its clear height of 150 ft. and long spans gave headway for vessels of any size or type.

From the engineer's point of view, it marked an epoch in the history of bridge building. Its enormous clear spans of 1,710 ft. between supports were rendered possible by the use of steel and by the cantilever design of the superstructure. The bridge, which carries

two railway tracks, slightly exceeds 1½ m. in length. There are three main piers from which the six cantilever arms rise and project, the ends of which, in the main spans, support and are connected by long girder spans. The height of the cantilevers, over the piers, above water level is 361 ft. The extremities of the end cantilevers rest upon masonry piers whence the rly. is carried to the shore on approach viaducts comprising a number of comparatively small steel bridge spans and masonry arches. Each main river pier consists of four circular masonry supports resting upon caissons 70 ft. in diameter, and sunk to a depth of from 70 to 90 ft. below water level.

The structure, designed by John Fowler and Benjamin Baker, comprises 51,000 tons of steelwork and 142,000 cubic yds. of masonry, cost nearly £3,000,000, and took seven years to construct. On Oct. 16, 1939, German aircraft attempted to bomb it in their first raid on the U.K. in the Second Great War. See Bridge illus.

**Fortification.** Art or science of fortifying a town, city, river-crossing, coastline, or other strategic position in order to defend it against an enemy. In early warfare, defence was always stronger than attack, and fortifications allowed of prolonged resistance by an army inferior to its opponents in numbers, equipment, mobility, or morale. The earliest type of fortification was the thorn hedge. Alexander the Great found the villages of the Hyrcanians defended by thick hedges, and similar defences are used to this day by primitive tribes in Africa and Asia. Early Roman fortifications had become more elaborate, with parapets built up by alternate layers of earth, tree trunks, and large stones, the front being covered by a bank of earth



strengthened by a palisade of trunks or hurdle work.

With the development of the ram and catapult, the principal offensive weapons in classical warfare, something stronger than earthworks was required, and the fortress (*q.v.*) was evolved with stone walls which often attained a thickness of 40 ft. Later a number of such fortresses were built and linked by small forts. Under the Romans the art of fortification became highly skilled, and on the frontiers of the Empire fortified towns were built, wherever possible on high ground banking to a river in front and with steep slopes falling away to the rear and sides. A castle or citadel stood on the highest part, and the landward sides of the town were surrounded by an enceinte wall, broken at intervals by high towers; the outer sides being protected by a ditch. Any bridge over the river would be defended by a bridgehead on the far side, while towered stockades were built out from either bank above and below the bridge. Passage under the bridge was barred by chains or booms.

Gauls and Visigoths retained the old Roman fortifications, but rarely improved upon them; one notable exception was Carcassonne, which the Visigoths fortified on the Roman model in the 5th century and which, rebuilt in the 13th, remains a monument to the medieval engineer. Towards the close of the 15th century the increasing fire power of artillery rendered the Roman and feudal defences obsolete. High, massive walls offered too great a target for concentrated artillery fire; on the other hand, effective fire could be obtained by the besiegers only if they sited guns close to the walls.

#### Vauban's Developments

Accordingly bastions were built to project from the curtain wall. The bastion had two faces and two flanks, enabling a cross fire to be directed against the massed artillery of the besiegers, while fire from the flanks of the bastion raked any frontal infantry assault. Ravelins or outworks were added, which during the 16th-17th centuries were extended until they culminated in the step-by-step defence system initiated by the French engineer Vauban (1633-1707). Until Vauban's day, little effort was made to adapt the defences to the topographical features of the site. Vauban retained thick masses of masonry to withstand heavy artillery fire, but added

secondary lines of defence on which the garrison, if driven back, could still resist. Vauban thus anticipated the principle of defence in depth ultimately exemplified in the Hindenburg Line of 1917 and the Siegfried Line of 1939.

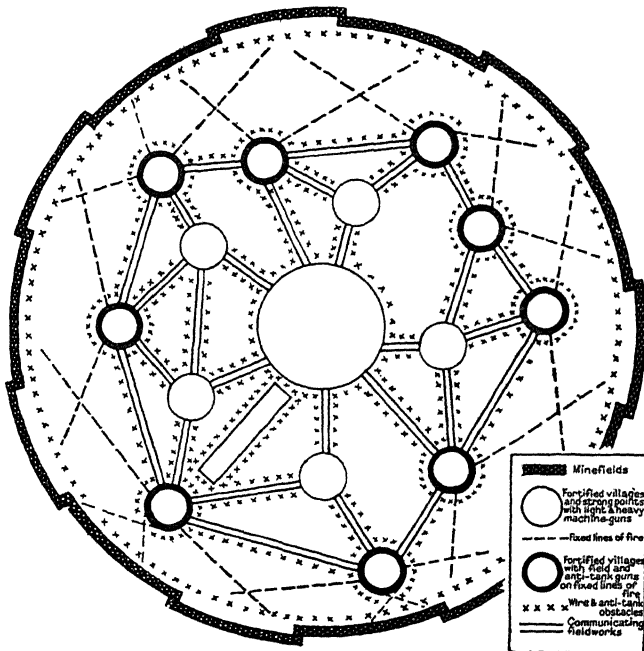
Vauban's theory of fortification continued throughout the campaigns of Marlborough and the Napoleonic Wars. Rapid development of artillery in the 19th century brought a great change. The rifled gun, with its greater range and penetrating power, made it necessary that the enceinte or circumvallation should be more amply defended. Therefore several small fortresses were placed in front of the main defences and sufficiently close to each other to give mutual support against attack.

The Franco-Prussian War, and particularly the siege of Paris, 1871, showed the uselessness of stone bastions and ramparts against modern artillery. Reinforced concrete and steel became the new material, with armoured cupolas and turrets for the artillery. That properly designed fortifications of this type could withstand high explosive was proved during the attack on Port Arthur by the Japanese in 1904. Port Arthur's fortifications included all the latest developments in armoured gun positions and

successive defence perimeters. Despite the use of 11-in. siege guns and the launching of repeated infantry assaults, they withstood a five months' siege, and fell only after the forts had been undermined by constant sapping.

#### In the First Great War

By 1914 the gun had regained the ascendancy, as was proved by the rapid fall of the Belgian fortifications under the fire of the German 17-in. siege gun. Liège, with its 12 armoured fortresses, fell in 11 days; Namur after four days' bombardment; the Antwerp forts in three. Manonville, on the French frontier, lasted only two days. Yet the obsolete fortifications at Verdun sustained tremendous punishment from artillery and were never reduced, though it was the trench lines of the advanced positions that actually stopped the Germans. Later in the First Great War both sides relied on field fortifications rather than fixed fortresses of steel and concrete. The former can be rapidly built in accordance with the latest tactical ideas; sited in positions most suitable at the time; better concealed from aerial observation; and provide greater opportunity for defence in depth. Exceptionally thick strong-points, or pill boxes, of reinforced concrete, are interspersed with minefields, wire entanglements, and



Fortification. Schematic diagram of a theoretical modern fortified position, giving all-round defence, without allowing for natural ground features

tank traps, while no section of the defences offers a large target to artillery or bombing aeroplanes. These principles were first applied on a large scale in the Hindenburg Line (*q.v.*).

Despite the lessons provided by the losses of their walled fortifications in 1914, both France and Belgium continued to rely upon that type for their defence; and the Germans adopted similar defences in their attempt to protect the Continent from invasion. The new Belgian system, the Albert Line, was breached by the Germans in the first rush of May, 1940, though the enemy's rapid successes were aided by the treachery of the defenders. France pinned her faith to the Maginot Line (*q.v.*), which embodied the latest theories of static defence in line. It is doubtful if the Maginot Line could have been carried by direct frontal assault; it fell because it was outflanked. But it lacked defence in depth, and had the Germans carried the main system the French resistance must have collapsed as there were no rear defence lines on which the French army could have fallen back.

Germany's Siegfried Line (*q.v.*) did afford defence in depth, having successive lines of gun positions, minefields, and tank traps. Had the Germans decided to hold it they might have delayed the Allied advance in 1945, but they were concentrating resistance on the Rhine. That the power of attack can overcome the strongest fortifications sited to the greatest disadvantage of the attackers was proved by the Allied assault on Germany's Atlantic wall in June, 1944. The attack was launched from the sea, one of the most difficult military operations, but air and artillery bombardment, particularly by the rocket gun, reduced all but the strongest positions to rubble, and broke the morale of the defenders sheltering in the depths of their emplacements.

The fortress system generally has become obsolete, and except in very favourable circumstances even defence in depth can do little more than delay an enemy well equipped with armour and heavy artillery. The invention of the flail tank, which clears the minefields, and the flame-throwing tank, which can burn out concrete and armoured positions, again gave the ascendancy to the attack. Russia halted the German advance in 1942 by means of the fortified zone—strongly defended islands of

resistance called hedgehogs (*q.v.*). But when the Germans tried to stem the Russian advance into the Reich by a similar system, armour and air power overwhelmed them.

**Fortingall.** Village of Perthshire, Scotland. It stands on the Lyon, 8 m. W. of Aberfeldy, and is a centre for tourists visiting Glen Lyon and Loch Tay. It has a fortification thought to be Roman, possibly prehistoric; a yew tree reputed 3,000 years old; and some regard this village as the birthplace of Pontius Pilate. Pop. 1,629.

**Fort Jameson.** Settlement in N.E. Rhodesia. On the Tanganyika plateau, it is about 300 m. N. of Tete by road and 125 m. W. of Lake Nyasa. It was until 1910 the headquarters of the administration of N.E. Rhodesia.

**Fort Johnston.** Settlement of Nyasaland, Central Africa, 6 m. S. of L. Nyasa. It is a trading port.

**Fort Knox.** U.S. gold depositary. See Knox, Fort, p. 4878.

**Fort Lamy.** Capital of Chad territory, French Equatorial Africa. Situated on the Shari just below its confluence with the Logone and S. of Lake Chad, it is a centre of communication, for from it radiate roads to the lake, to Kano, Abeshir, Fort Archambault, Carnot, Yaoundé, El Obeid, and Khartum. It is the headquarters of the lieutenant-governor of the colony. During the Second Great War it was a vital link for the Allies in air communication between W. and E. Africa and Egypt; its airfield was a refuelling station. Fort Lamy was also the base from which Free French forces attacked Italian outposts in the Libyan desert and whence General Leclerc's column set out to join the British 8th army in Tripoli, Jan., 1943. The town was attacked by Axis aircraft but suffered little damage. Pop. 6,000.

**Fortnightly Review.** THE. London monthly review first published as a fortnightly, May, 1865, under the editorship of G. H. Lewes, and the chairmanship of Anthony Trollope. John Morley became editor in 1867, and made it a monthly. Its contributors have included J. S. Mill, T. H. Huxley, Herbert Spencer, Swinburne, Barrie, H. A. L. Fisher, Wells, Julian Huxley, J. Middleton Murry, W. R. Inge, Dorothy L. Sayers, and Harold Laski.

**Fort Peck Dam.** Dam on the Missouri river in N.E. Montana, U.S.A. Built by the U.S. engineer corps, it was begun in Oct., 1933, and completed in Oct., 1940.

This largest earth-fill in the world has a total crest length of 4 m. and a maximum height of 250 ft. It comprises a main section across the river valley of 10,578 ft. and a large dyke section on the W. bank 10,448 ft. long. The average width of the base is 3,500 ft., and the top, carrying a hard road, is 100 ft. wide. The dam contains 123,000,000 cu. yds. of earth, 7,000,000 cu. yds. of gravel, and 1,000,000 cu. yds. of rock. Four tunnels by-pass water releases from the reservoir. A power plant at the outlet of one tunnel is equipped with three turbo-generators having a combined capacity of 105,000 kilowatts. The water release from the other three tunnels maintains a navigational level on the Missouri.

**Fort Portal.** Chief centre of the Toro district, Uganda. It is a missionary station and native town about 25 m. N.W. of Mt. Ruwenzori. Pop. 25,000.

**Fortress** (O. Fr. *forteresse*, from Lat. *fortis*, strong). Permanent military strong-point, sited, garrisoned, and equipped to provide a point of resistance in case of attack, and to act as a rallying point for troops who may be compelled to fall back from more exposed positions. The earliest fortress was a palisade enclosure, such as is still employed by primitive peoples in tribal warfare. The Saxon fortress was an artificial mound enclosing a number of huts, in which the local population sought refuge in time of war. The Romans also used mound enclosures or fortified camps, but these developed into elaborate systems of fortification.

Most early fortresses were built of earth and wood, and it was not until the rise of the feudal system that stone fortresses were built on any great scale. The typical feudal fortress consisted of a large walled space, protected by a moat, and could be entered only through a strongly defended gate. Later the walls were machicolated, and corner towers were added to allow of flanking fire along the walls. With the development of artillery the individual fortress became generally obsolete. See Fortification.

**Fortress.** Official British name for the heavy bomber known to the U.S.A.A.F. as Flying Fortress (*q.v.*).

**Fortrose.** Royal, mun. and seaport town of Ross and Cromarty, Scotland. It stands on the Moray Firth, 9 m. N.E. of Inverness, on a branch railway line. There is a good harbour, and the fine

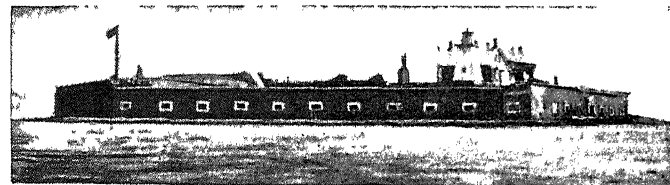
scenery, bathing facilities, and golf links attract many visitors. Fortrose was formerly the seat of the bishops of Ross, but the episcopal palace and cathedral were destroyed by Cromwell, who built his fort at Inverness with the stones. Pop. 875.

**Fort Royal.** Former name of the town of Martinique, French W. Indies, now known as Fort-de-France (*q.v.*).

**Fort St. David.** Ruined fort of Madras, India, in the S. Arcot district. It is on the Coromandel coast, less than 2 m. E. of Cuddalore New Town. At one time the site of Dutch and French settlements, the fort was bought by the English in 1690, together with the land within the radius of a "randonne shott of a great gun." The gun was actually fired, the shot indicating the extent of the boundaries. The name is supposed to have been given to the fort by a Welsh governor. The fort was captured by the French in 1758, who demolished the fortifications, but after changing hands again twice, it was finally restored to the English in 1785.

**Fort Sumter.** Fort in S. Carolina, U.S.A. It stands on a shoal at the entrance to Charleston

harbour, 3 m. S.E. of Charleston. It was bombarded by the Confederates, April 12, 1861, and surrendered the following day, the action immediately leading to the opening of the Civil War. In April, 1863, it was violently bombarded by the Federal fleet in the first of a series of naval and land assaults which ruined it by October.



Fort Sumter. The island fortress at the entrance to Charleston Harbour, the scene of fighting in the American Civil War

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**Fortuna.** In Roman mythology the goddess of chance or good luck. There were several temples in Rome erected in her honour, but the most famous seats of her worship were Antium and Praeneste. She is also called Fors Fortuna. In art she is represented with a rudder as symbol of her guidance of things, also with a cornucopia as a symbol of the prosperity she brought to mankind.

**Fortunate Isles.** Alternative name for the Islands of the Blessed, or the Elysian Fields, of early Greek

mythology. They were supposed to be at the edge of the earth, and were vaguely spoken of as beyond the Pillars of Hercules, *i.e.* the Straits of Gibraltar. It has been generally accepted that the Canary Isles are the Fortunate Isles of the ancients. Ben Jonson produced a masque entitled *The Fortunate Isles* in 1626. See *Elysium*.

**Fortunatus.** Character of a folk-tale found among many different races. It first appeared in print in a German form in 1509. Fortunatus is possessor of an inexhaustible purse, a wishing cap, and other marvels in different variants of the tale. The moral goes to show the little value to be put upon material treasures. The story was dramatised in Germany by Hans Sachs, 1553, and in England by T. Dekker, 1600. One named Fortunatus succoured the Apostle Paul.

**Fortunes of Nigel, THE.** Fifteenth of the Waverley novels, published in May, 1822. In it Sir Walter Scott followed his masterly portraits of Mary Stuart and Elizabeth Tudor with an equally brilliant character-study of James I, and supplied vivid pictures of early 17th century London, from Alsatia to the Court. Nigel Olifaunt, Lord Glenvarloch, the young Scottish

palmistry, astrology, crystal-gazing, lot-casting by cards or otherwise, and subjective processes.

The alien origin of fortunetelling in Britain is confirmed by the fact that it is not a common-law offence. Its punishment as a form of witchcraft by death, under a statute of 1563, was reduced by the Witchcraft Act, 1735, to imprisonment for one year and the pillory. Under the Vagrancy Act, 1824, any person who undertakes to tell fortunes, or uses any subtle craft, means, or device, by palmistry or otherwise, to deceive and impose upon any person, is liable to imprisonment as a rogue and vagabond. It was held in one case that intention to deceive was a necessary part of the crime, so that a person who honestly believed in his powers of prediction could not be convicted, but this was later overruled. Spiritualist mediums have also been convicted. See *Divination*; *Palmistry*.

**Fortune Theatre.** A London playhouse, in Russell Street, W.C.2. It was opened in 1924, and presented such notable plays as O'Casey's *The Plough* and the Stars, Lonsdale's *On Approval*, and Chekhov's *The Seagull* and *The Three Sisters* (Komisarjevsky's productions). After being (in conjunction with Drury Lane) the headquarters of Ensa (*q.v.*), it was reopened in 1946. The theatre has a seating capacity of 493.

**Fort Wayne.** City of Indiana, U.S.A., the co. seat of Allen co. At the confluence of the St. Joseph and St. Mary rivers, which here merge into the Maumee river, it is 105 m. N.E. of Indianapolis and is served by several rlys. and two airports. It contains Concordia College and several schools and institutions. An important rly. and trading centre, in a hardwood timber region, it has rly. workshops, flour mills, foundries, and chemical, piano, and soap factories, as well as making engines, machinery, oil tanks and pumps, and furniture. On the site of a fort built in 1794, Fort Wayne received a city charter in 1840. Pop. 118,410.

**Fort William.** A police burgh and tourist resort of Inverness-shire, Scotland. It stands on the E. shore of Lower Loch Eil, at the foot of Ben Nevis, 65 m. S.W. of Inverness, on a branch railway line. The town was known as Inverlochly when Montrose defeated the Covenanters, Feb. 2, 1645. The fort, erected by Monk in 1655 and rebuilt by Mackay in

nobleman who comes south to petition the king; his devoted servant, Richie Moniplies; the profligate Lord Delgarno; the crabbed old courtier Sir Mungo Malagrowth; "Jingling Geordie" Heriot; the wealthy goldsmith; Margaret Ramsay, the modest but courageous heroine; and the unhappy ship-chandler, John Christie, are memorable characters in the work.

**Fortune-telling.** Revelation by non-rational processes of what is to befall a person in the future. As one of the principal aims of divination it is traceable from its first recorded manifestations in ancient Babylonia into early China and India. Thence it was brought across medieval Europe by the gipsies, who are recorded by Pepys as having practised the art at Lambeth under society patronage in 1688. As a modern superstitious survival it is associated with



The ruined Forum, looking north-west towards the Capitol: the three pillars with architrave in the middle distance were part of the temple of Castor and Pollux.

Top: a reconstruction of part of the Great Forum in imperial times, with a religious procession passing the temple of Castor and Pollux. Beyond is the Basilica Julia.

**FORUM: CENTRE OF THE LIFE OF ANCIENT ROME**

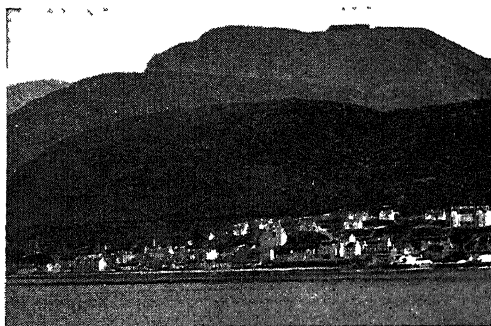
1690, successfully withstood siege by the Jacobites in 1715 and 1746; it was dismantled in 1860. Fort William is a starting-point for the ascent of Ben Nevis (*q.v.*). Industries are concerned with aluminium and distilling. Pop. 3,200.

**Fort William.** A port and city of Ontario, Canada, in Algoma dist. It stands at the head of Lake Superior, on the left side of the Kaministiquia river, its importance being due to its position at the head of navigation. It is 420 m. E.S.E. of Winnipeg, and is served by C.P.R. and C.N.R. It has a street rly. which goes to Port Arthur, 3 m. Steamers ply from here to the ports on the Great Lakes and the St. Lawrence, and there are immense elevators to handle grain brought from the W. In addition to its shipping, for which there is 28 m. of deep-water frontage, the city has flour mills, iron foundries, and other industries. It owns 31 m. of street rly., telephone, lighting, water, and sewerage systems. It was founded in 1801 as a Hudson Bay trading post. Pop. 20,585.

**Fort Worth.** A city of Texas, U.S.A., the co. seat of Tarrant co. On Trinity river, at the confluence of its Clear and West Forks, it is 30 m. W. of Dallas, has an airport, and is served by several rlys. The chief rly. centre of the S.W. and a port of entry, it is also the centre of the oilfield and cotton growing region of West Texas, the only primary grain market in the S. and a big livestock market and meat packing centre. It ranks third among U.S. cities in the volume of air mail handled. Products include flour, ranch and oil-field equipment, cotton goods and cottonseed, cement, footwear, and clothing. A bomber assembly plant, established 1941, produced in 1950 one B-36 bomber weekly. Three dams stand on the W. Fork. The city, incorporated 1873, occupies the site of a military camp established in 1849, which never became a fort. Pop. 177,662.

**Forty-Five, THE.** Name given by the Scots to the rising that took place in Scotland in 1745. Charles Edward (*q.v.*), the Young Pretender, landed and led an army into England, marching as far south as Derby, Dec. 6. The Scots then withdrew and were totally defeated at Culloden, April 16, 1746. This was the last serious attempt of the Stuarts to regain the throne. See Fifteen, The.

**Forum.** Among the ancient Romans, any open space used for public business. More particularly



Fort William, Scotland. The town, with Ben Nevis in the background, viewed from Loch Eil  
*Hardie*

the term was applied to the open space in Rome, an irregular oblong in shape, lying between the Palatine and Capitoline hills, known as the Forum Romanum. Here the assembly of the people met; here magistrates and others addressed them from the tribunal or *rostra*. Adjoining were the Curia or senate house, the Basilica Julia and Basilica Aemilia, the temples of Julius and Vesta. Along one side the Sacra Via led to the Capitol (*q.v.*).

With the growth of the city other *fora* were added; the Forum Julium by Julius Caesar, the Forum Augustum, and the Forum Pacis, where Vespasian erected a temple of Peace, containing spoils from the temple of Jerusalem. The Forum Trajanum, erected by the emperor Trajan, surpassed all others in size and splendour, and remains the greatest monument of Roman architecture. Its most conspicuous feature was the column of Trajan, erected by the emperor in commemoration of his victories. See Rome.

**Forum Appii** (mod. Foro Appio). Ancient town of Latium, on the Appian Way (*q.v.*). It stood amid the Pontine Marshes, 42 m. S.E. of Rome, and near a canal which extended S. to near Terracina. The apostle Paul passed through the town on his way to Rome.

**Foscari, FRANCESCO** (1373-1457). Doge of Venice. After holding various offices in the republic he was elected doge in 1423. Ambitious to extend Venetian power, he took an active part in the politics of the mainland, entering a league against the Visconti of Milan in

1426, thereby acquiring Bergamo, Brescia, and Cremona. In 1441 Velaggio, Peschiera, and Lonato were added to the Venetian territories. The misdeeds of his son, Giacopo, brought about the doge's deposition, Oct. 24, 1457, and he died Nov. 1. Byron's tragedy, *The Two Foscari*, is founded on the

lives of Francesco and his son.

**Foscolo, Ugo** (1778-1827). Italian poet, romancer, and patriot. Born at Zante, Jan. 26, 1778, of

Venetian and Greek descent, and christened Niccolò, he changed his first name to Ugo. His story, *Lettere di Jacopo Ortis*, 1798, reflects the melancholy of the romantic period, and his best known poem, *I Sepolcri*, 1807, was inspired by the reverence due to the tomb and the immortality of the memories of the great. Foscolo served for a time in the French army, but, disillusioned as to Napoleon's intentions, sought refuge in England when the Austrians took Milan. He died at Turnham Green, Oct. 10, 1827. Buried at Chiswick, his remains were removed to Florence in 1871.

**Fossa** or **FOUSSA** (*Cryptoprocta ferox*). A carnivorous mammal, found only in Madagascar, and placed by most zoologists between the cat and the civet. It is about 5 ft. long, including the tail, which is nearly as long as the body. The fur is pale brown in colour, and the claws retractile like those of a cat.

**Fosse** (Lat. *fossa*, ditch). Excavation outside the ramparts or outer walls of a fort. Its purpose was to hinder the advance of an enemy, and make it impossible for him to find ground upon which to erect scaling ladders. Frequently filled with water, its effectiveness was also occasionally increased by its being planted with pointed stakes and palisades. Barbed wire entanglements may also be placed in it. See Castle; Fortification.

**Fosse Way.** Early English name for an ancient British highway from Axminster to Lincoln.



Ugo Foscolo,  
Italian poet



Francesco Foscari,  
Doge of Venice  
*After Gentile Bellini*

incorporated in the Romano-British road system, no part of its 182 m. deviates more than 6 m. from a straight line between these places. It runs through Bath, Cirencester, High Cross, and Leicester. Mentioned in an Anglo-Saxon charter, 744, it ranked as one of Edward the Confessor's four royal roads.

**Fossil** (Lat. *fossilis*, dug up). Term applied to organic remains whether plant or animal, or to direct evidence of their existence, preserved in any formation of the earth's crust, whether hard rock or superficial deposit. Fossils are not necessarily of great antiquity; bones of a sheep buried under recent flood deposits, as well as ancient organic remains, have been considered fossils. The term also includes the tracks of animals preserved in strata, such as dinosaur footprints, or other markings or impressions made by living creatures.

Fossilisation is the process of burial and subsequent preservation. The ultimate mode of

small. Few organisms remain buried for long without undergoing some chemical change; e.g. vegetable remains lose their volatile constituents, and a part of their carbon content remains as a thin film. The frozen mammoths of Siberia, however, with flesh and hair intact, are examples of preservation in an almost unchanged condition. Outlines of soft parts are sometimes preserved, like the impressions of wings of pterodactyls (winged reptiles) found in Bavaria; but shells, bones, and teeth are the most likely parts to be preserved.

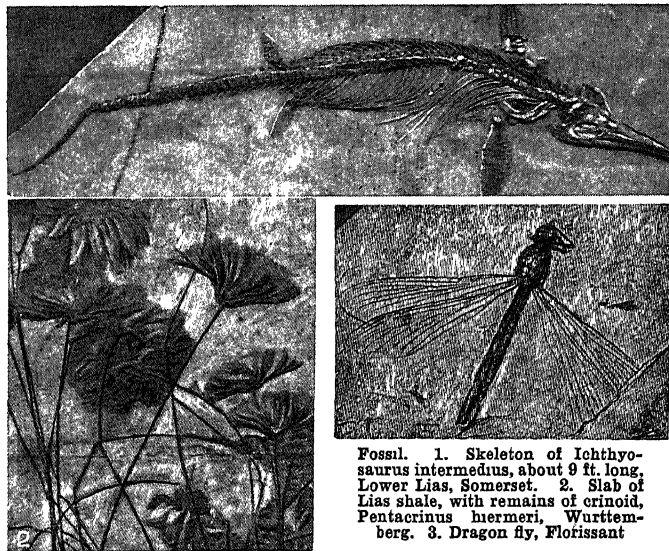
Buried hard parts generally undergo petrification, i.e. solution of the original substance and its gradual replacement by mineral matter. Sometimes perfect details are preserved. Frequently the animal or plant is dissolved away and a cavity or mould is left in the enclosing rock. If the cavity is filled by infiltration of mineral matter a cast results. A hollow body such as a shell may become filled with material and, after solu-

far above sea level led the early Greek philosophers to invoke encroachments of the sea upon the land as an explanation. William Smith (the "father of English geology," 1769-1834) discovered that each member of a stratified series of rocks contained a definite assemblage of fossils, and that the same strata were always found in the same order of superposition. The essential value of fossils therefore is that they serve to distinguish individual horizons in a rock sequence.

For a long time all organic remains in rocks were attributed to the Noachian deluge, or to several such deluges, with successive special creations. But the great variety of fossils and their gradual progression from the earliest deposits to the present day gave the death-blow to this cataclysmal hypothesis, and led Darwin to propound his theory of evolution in 1859. Every plant and animal is found to possess a complicated history going far back into geological time, and the general succession of forms is consistent with slow evolution from simple to complex.

This evolutionary concept put new zest into palaeontology, the study of fossils, and led to detailed investigation of range, distribution, and lines of descent of fossil communities. This knowledge is being applied in the study of strata, or stratigraphy. Palaeontology, while remaining one of the highest branches of natural history, has important economic aspects. It is of fundamental importance in the search for oil, and in the correlation and investigation of coal seams. See *Evolution*; *Geology*; consult also *Invertebrate Palaeontology*, H. L. Hawkins, 1920; *Introduction to Palaeontology*, A. M. Davies, 1925; *Outlines of Palaeontology*, H. H. Swinerton, 2nd ed. 1930.

**Fossombrone.** City of Italy, in the prov. of Pesaro. The ancient Forum Sempronii, it stands on the Metauro 10 m. E.S.E. of Urbino. It has a castle and a cathedral rebuilt in the 18th century. There are silk factories and mineral springs. Ruins of the Roman city, destroyed by the Goths and Lombards, lie about 2 m. N.E. of the town, which had a bishop in the 6th century. In the Second Great War Fossombrone was overrun by the 8th army in late Aug., 1944; churches and secular buildings suffered a certain amount of damage; while three bridges were blown up by the Germans.



Fossil. 1. Skeleton of *Ichthyosaurus intermedius*, about 9 ft. long, Lower Lias, Somerset. 2. Slab of Lias shale, with remains of crinoid, *Pentacrinus hiermeri*, Württemberg. 3. Dragon fly, Florissant

occurrence of the fossil depends on such factors as the nature of the organism, its habitat and mode of life, the time and mode of burial, and events subsequent to its entombment. Fossilisation is achieved either by the checking of decomposition, or by the replacement of the hard parts of the body (bones, shell, etc.) by some relatively more durable substance; and it appears to be a lucky accident: the proportion of forms preserved to those lost is very

tion of the shell, an internal mould will occur in reversed relief, on which muscle impressions, etc., may be preserved.

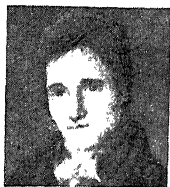
Fossils have been known to exist in rocks since ancient times, but were first thought to be merely freak imitations of living forms. The identification of detailed structures in corresponding living and fossil forms led to the adoption of the view that they were relics of organisms once alive. The discovery of fossils in rocks



**Foster.** Name of a family of English cricketers. The sons of the Rev. Henry Foster, a master at Malvern College, they were there educated. Their names were H. K. Foster, Capt. W. L. Foster, D.S.O., who won this honour in Somaliland, R. E. Foster, B. S. Foster, G. N. Foster, and M. J. A. Foster. All played for Malvern and Worcestershire, which was sometimes called on this account Fostershire. H. K., R. E., and G. N. Foster gained their blues at Oxford.

Reginald (1878-1914) was the finest batsman and fieldsman of the brothers. At Lord's in 1900 he scored a century in each innings for the Gentlemen against the Players, and at Sydney in Dec., 1903, he scored 287 against Australia, a record for a test match until 1930. He died May 13, 1914. Basil (b. 1882) gained distinction as an actor and theatrical manager, specialising in comedy. Frank R. Foster (b. 1889), a great all-rounder who played cricket for England and captained Warwickshire, was no relation.

**Foster, JOHN** (1770-1843). British essayist. Born near Halifax, Sept. 17, 1770, the son of a yeoman weaver, he spent his early years at the loom. At 17 he joined the Baptists, and, after study at Brierly Hall and the Baptist College at Bristol, he took a pastorate at Newcastle-on-Tyne, 1792. In 1805 appeared his *Essays*, by which he is chiefly remembered. These, particularly that *On Decision of Character*, are distinguished by imagination, depth, eloquence, and sincerity. He died at Stapleton, near Bristol, Oct. 15, 1843.



John Foster,  
British essayist

**Foster, MYLES BIRKET** (1825-99). British artist. Born at North Shields, Feb. 4, 1825, of Quaker parentage, he studied under Ebenezer Landells, wood engraver, for whom he drew many illustrations on the blocks. Starting on his own account in 1846, he illustrated in black and white many poetical publications, and in 1859 turned to water-colour, painting



M. Birket Foster,  
British artist

especially idyllic landscapes in Surrey and other home counties. He became associate of the Royal Water Colour Society in 1860 and member in 1861. He died at Weybridge, March 27, 1899.

**Foster, STEPHEN COLLINS** (1826-64). American song writer. Born near Pittsburgh, July 4, 1826, he was chiefly self-taught as a musician. He graduated at Jefferson College, and from 1842 produced sentimental but memorable songs, mostly based on negro subjects and with words in negro dialect. These included *The Old Folks at Home*, *My Old Kentucky Home*, *Massa's in de Cold*, *Cold Ground*, *Old Black Joe*. The melodies are usually ascribed to Foster, but probably the words were adapted to suit the minstrel companies who first sang his songs. He died in New York, Jan. 13, 1864. Memoirs were published by his brother, Morison Foster, 1896, and H. V. Milligan, 1920.

**Fosterage.** Term used for the nursing and bringing-up of children by others than their parents. The custom prevailed in ancient Ireland, where the ties of fosterage were almost as close as those of blood relationship. Fosterage was undertaken either for payment or from affection, and lasted until the age of 13 for girls and 17 for boys. Apparently the mother paid for the fosterage of the boys and the father for that of the girls. A child was obliged to provide for the foster-parent in old age. *See* Family; Kinship.

**Fotheringhay.** A parish and village of Northamptonshire, England. It stands on the Nene, 4 m. N.E. of Oundle. Few traces remain of its 11th century castle, famous as the scene of the imprisonment, trial, and execution of Mary Queen of Scots in 1587, and as the birthplace of Richard III in 1452. Pop. 213.

**Foucault, LÉON** (1819-68). French physicist. Born Sept. 18, 1819, and educated privately, he became physicist to the Paris Observatory, where he constructed various instruments, of which the gyroscope and the polariser which bear his name were the most notable. He determined the relative velocities of light in air, in water, and in a vacuum and the existence of eddy currents in conductors in electro-magnetic fields; but is best remembered by "Foucault's pendulum." From the roof of the Panthéon in Paris he hung a pendulum 200 ft. long, free to oscillate in any direction. The pendulum never retraced its path,

but always deviated to the right, showing that the floor was moving and the earth rotating. Foucault died in Paris, Feb. 11, 1868. *Prom.* Foo-co.

**Foucault Currents.** Currents induced in solid iron cores by alternating current passing through coils wound thereon, and also by rotation in a magnetic field. *See* Electricity; Magnetism.

**Fouché, JOSEPH** (1759-1820). A French politician. Born near

Nantes, May 21, 1759, he was educated by the Oratorians in Paris. Ordained priest, he became a teacher and rose to be principal of Nantes College in 1780. Throwing in his lot with the Revolution,

he sat in the National Convention (1792), became a Jacobin, and vehemently advocated the execution of Louis XVI. Having renounced his orders, he was the moving spirit in the mummeries of the worship of reason and the spoliation of the churches.

Instrumental in the fall of Robespierre, 1794, Fouché became minister of police in 1799. Under Napoleon he retained this position, was raised to the senate, and, under the empire, was also minister of the interior. He was made duke of Otranto in 1808 and governor of Illyria in 1813. After Leipzig, seeing that Napoleon's power was on the wane, he prepared to desert to the Bourbons, under whom, after 1815, he again became minister of police. But he was exiled as a regicide in 1816, and died in Trieste, Dec. 25, 1820. It was Fouché who said of the murder of the duc d'Enghien, "It was worse than a crime; it was a blunder." *Consult* Life, S. Zweig, Eng. trans. 1930.

**Fougasse (Fr.)** Military mine originally placed under the glacis or ditch of a fortress. It is sometimes used to defend a defile or other approach by throwing a shower of stones upon the enemy. An excavation is made, the axis of which is inclined at an angle of about 40° to the horizon; it is about 4 ft. deep, in the form of a frustum of a cone, 5½ ft. at the surface. In a recess at the bottom is placed a square box of gunpowder, inclined to the horizon at 40°, and on the box a wooden shield about 6 ins. thick. The excavation is filled up with stones, the excavated



Joseph Fouché,  
French politician

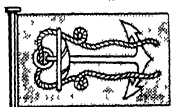
earth being placed in a mound in a line with the powder box to increase the resistance upwards, and so ensure the effect of the explosion upon the stones at the required angle; the fuse is led up from the box over the mound. The modern fougasse discharges burning oil, and the hedgehog fougasse can be concealed behind a wall or rise, over which it will jump on being fired.

**Fougasse.** Pseudonym of the humorous artist C. K. Bird (*q.v.*).

**Fougères.** Town of Brittany, France. It stands on the Nançon, in the dept. of Ille et Vilaine, 30 m. N.E. of Rennes. The chief buildings are the churches of S. Sulpice and S. Leonard, both of the 15th century, while there are remains of the castle and other fortifications built to protect the town in the Middle Ages. The castle, standing on a rock, was partially restored in the 20th century. Its eleven battlemented towers give an idea of its original size and strength. The hôtel de ville dates from the 15th century, and there are some old houses. The town is now a market for agricultural produce and a centre of tanning and other industries connected with the manufacture of boots and shoes. Granite is found in the vicinity. Fougères was long one of the strong places of Brittany, and was taken by the English in 1166 and 1448. In the Second Great War it was liberated by American armoured forces, Aug. 5, 1944. Pop. 19,281.

**Foula.** One of the Shetland Islands, Scotland. It lies 16 m. to the S.W. of the mainland, and is frequented by sea-fowl, the skua breeding here. It is a thriving fishing centre. Its length is  $3\frac{1}{2}$  m., breadth  $2\frac{1}{2}$  m., and highest point 1,370 ft.

**Foul Anchor.** Nautical term used to describe an anchor having one or both flukes entangled in the chain or rope. This is the device



Foul Anchor.  
Admiralty ensign

of the British Admiralty, the Admiralty flag being a yellow foul anchor on a red back-ground.

**Foulard** (Fr.). Soft, thin, flexible fabric made of silk or silk and cotton, usually printed in colours on a light or dark ground, or having a white spot on a dark coloured ground.

The name was formerly applied to a gauze ribbon material manufactured in France.

**Foulis, ROBERT** (1707-76). Scottish printer. He was founder of the Foulis Press and was born at Glas-



Robert Foulis,  
Scottish publisher  
From a medallion by  
J. Tassie

gow, April 20, 1707. While a barber's apprentice he attended the university lectures of Francis Hutcheson, on whose advice he started business as a printer and bookseller in 1741. Two years later he was appointed printer to Glasgow university, and in 1744 took his brother Andrew (1712-76) into partnership. After the death of the two brothers the business was continued by Robert's son, Andrew (d. 1829).

The Foulis Press issued more than 550 vols., reprints of Greek, Latin, and British classics, remarkable for beauty of type, format, and textual accuracy. They included the "immaculate" Horace, 1744; the fine Homer, in four folio vols., 1756-58; a folio edition of Paradise Lost; and the poems of Gray and Pope. A collection of Foulis books is in the Mitchell Library, Glasgow. *Pron.* Fowls.

**Foulness.** Island and village of Essex, England. The island lies at the mouth of the Crouch, 7 m. N.E. of Shoeburyness, and is 5 m. in length by  $2\frac{1}{2}$  m. in breadth. It is protected from the sea by a dyke. The village church built in 1850 replaced a wooden structure. A replica of Hitler's West Wall was built on the island in 1943, and for months it was bombarded with experimental shells, rockets, and explosives. From the results of these experiments were devised the close-support weapons that breached the West Wall in France. Pop. 400.

**Foumart.** This is a contraction of foul marten, an old name for the polecat (*q.v.*).

**Foundation** (Lat. *fundare*, to lay the bottom of, found). Literally, the base of a building, or that upon which a structure rests. It is freely used, however, for a society, such as a college or school, hospital or monastery, which is endowed, and so founded or set up on a permanent basis. The money given for this purpose and the conditions for which the society exists are the foundation, the work of the founder.

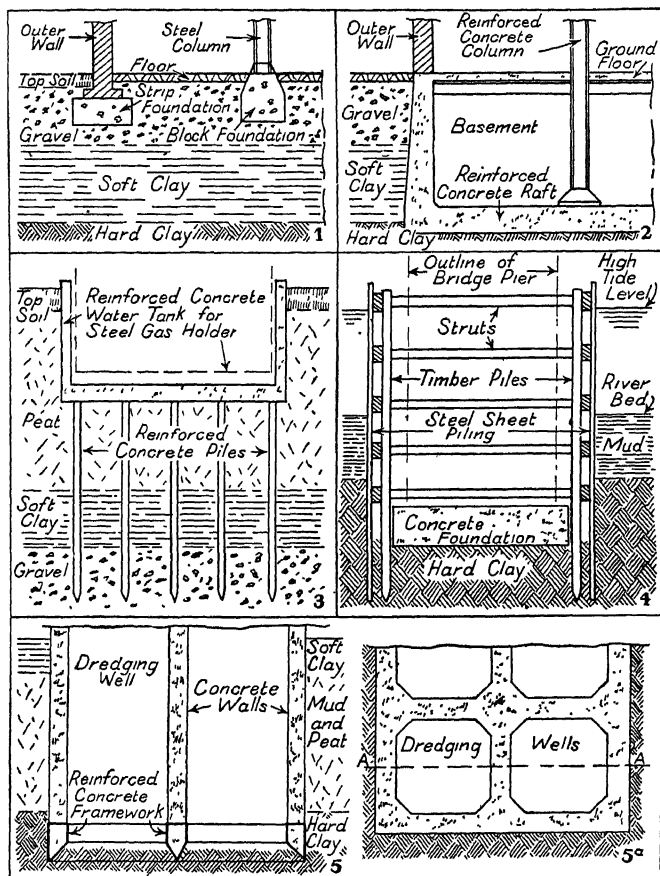
Those on the foundation of a college at Oxford or Cambridge, or of a school such as Winchester and Eton, are those scholars and others who receive money from the college funds, under the conditions laid down by the statutes. Permanent charities, such as an alms-

house or a hospital, are also known as foundations, as are cathedrals. The chapters of the English cathedrals are divided into old foundations and new foundations. The former are those which were unchanged at the Reformation; the latter those which, being then composed of monks, were provided with new chapters. *See* Cathedral.

**Foundation.** That part of a building, bridge, or other structure which transfers the weight of the structure and the loadings imposed on it to the subsoil. The types of structures, the loadings thereon, and the types of subsoil on which structures can be built are widely variable, and the selection and design of suitable foundations requires the combination of theoretical and practical knowledge of construction with skill in design.

Subsoils include stiff river weed; waterlogged peat bogs; soft, medium, and stiff clays; running sand; moist or dry sand or gravel; chalk which may be as soft as mud or as hard as soft rock; and solid rock. Increasing knowledge of the strength and behaviour of these materials under load resulted in a new science of soil mechanics, the exponent of which was Prof. Karl Terzaghi. By using methods which he originated, it became possible to explain previously inexplicable failures, and to design foundations in difficult soils more economically and with a greater degree of confidence than formerly. These methods involve a thorough exploration of the subsoil by boreholes. Samples of the subsoil are taken at various depths and their strength is determined by laboratory methods. Clays are particularly troublesome; because of slow changes under load they may eventually fail after carrying the load of the structure safely for 100 years. The old Waterloo Bridge across the Thames failed partly for this reason.

**SHALLOW FOUNDATIONS.** Where the structure load per sq. ft. of foundation is small, as in houses, factories, and other buildings not more than four storeys high on good subsoil, shallow foundations, usually with strips and blocks of concrete under the walls and columns, are adopted. Failure may occur if there is a weak subsoil close below the foundations, as in Fig. 1. Other causes of failure are frost-heaving of silts and silty sands in winter, and shrinkage of clays in summer. Where strip and block foundations involve loading the subsoil too heavily, a concrete raft or a concrete box forming a



Foundation. Details of typical foundations. 1. Factory foundations on poor soil, liable to settle. 2. Reinforced concrete basement foundation. 3. Typical foundation supported on reinforced concrete piles. 4. Bridge foundation built in sheet piled cofferdam. 5. Reinforced concrete monolith foundation; showing section marked AA in 5a, which is a part sectional plan of the same foundation

basement to the building will spread the load (Fig. 2).

**PILED FOUNDATIONS.** If the upper subsoils are too weak to carry the structure loads, groups of piles founded at lower levels may be used (Fig. 3); but it is necessary to determine whether the lower subsoil can safely carry the ground above it as well as the structure load. Piles may be driven or formed in place.

**DEEP FOUNDATIONS IN COFFERDAMS.** Where the load per sq. ft. is high, and a suitable subsoil can be reached at a moderate depth, bridge piers in larger rivers and quay walls are frequently founded on large blocks of concrete formed in cofferdams. Sheet piling is driven to form a square or rectangle, and is then strutted with timber or steel (Fig. 4). The part of the piling in the clay forms a "cut-off" wall which prevents the water from percolating into the coffer-

dam, and the foundation is built under dry conditions after the water has been pumped out. This method was used for the second permanent Waterloo Bridge.

**WELLS AND CYLINDERS.** Where the load is not so heavy, or where the foundation is to be formed on land rather than through water and the upper subsoils are weak, well or cylinder foundations may be used. A framework of timber, steel work, or reinforced concrete is formed on the site of the foundation and walls of brickwork or concrete are built above it. The material inside the well is excavated, and the well structure sinks into the subsoil. Further walling is added and the process is repeated. Concrete or pig-iron may be piled on top of the walling to assist the well to sink to the correct level. When a suitable subsoil has been reached the well is pumped dry and filled with con-

crete. If it is desired to sink a cylinder foundation under "dry" conditions, and the ground water pressure is such that this cannot be done by ordinary means, air locks are fitted to the top of the cylinder and air is forced in under pressure to keep the water out, as in the diving bell. Men and materials enter the cylinder through the air lock, and when the outer door is shut the air pressure is increased to that inside the cylinder.

**MONOLITH FOUNDATIONS.** Monoliths are similar in structure to cylinder foundations, but are larger and usually square or rectangular. They are subdivided by two or more cross walls into a number of "wells" (Fig. 5) and sinking of the monolith is controlled by "grabbing" from the wells as necessary. The main towers of the recently completed Howrah Bridge, Calcutta—which was begun before the Second Great War and opened to traffic in 1943, and is a double cantilever steel structure of 1,500 ft. clear span—are founded on monoliths sunk over 100 ft. through soft clay and silt to hard clay. The monoliths are the largest and deepest ever used under similar conditions. Concrete floors were formed at foundation level, and the walls were left unfilled to reduce the weight on the clay. Reinforced concrete roofs were raised over the wells at ground level, and on these the bridge towers were successfully built.

**Foundation Day.** Public holiday observed in Australia on Jan. 26. It commemorates the anniversary of the first British settlement in Australia, when Capt. Arthur Phillip landed a party of convicts and marines on the shores of Sydney Cove, Port Jackson, New South Wales, Jan. 26, 1788.

**Foundation Garment.** Name given to a feminine garment designed to support the body without the help of whalebone or steel. The first garments of this kind were introduced in the 1890s and were of bodice type, giving support by the skill of their cut, by stitching, and by the use of two or more thicknesses of material at points of strain. The foundation garment did not achieve wide popularity, however, until the invention of a fine elastic yarn in 1930 made it possible to weave a firm yet yielding material with a two-way stretch, which was used wholly or in part to make pull-on and roll-on girdles and corsettes. With a girdle, which normally

reached little above the waist, a separate brassière was usually worn; this garment, designed to protect and support the bust as well as, where necessary, to improve its appearance, came into vogue after the high, rigid corset of the early years of the 20th century went out of fashion. Support for the bust, cut in brassière style, was incorporated in the corsetette. *See Corset.*

**Foundation Sacrifices.** Ritual immolation at the foundation of a building or settlement. Human skeletons are found beneath cornerstones in early Palestine, as at Gezer and Megiddo. When Mandalay was built, 1860, 52 human victims were buried alive. Legends of living burial are recorded of S. Columba's Cathedral, Iona; S. Patrick's monastery, Clonmacnoise. Animal bones were unearthed beneath old S. Paul's and Blackfriars Bridge, London. The Scandinavian kirk-grim was the spirit of the foundation victim. Animal slaughter as a foundation rite survives from W. Africa through Coptic Egypt and Muslim Syria to Borneo. The interment of statues in ancient Rome and effigies in medieval Europe points to an anterior custom of actual blood-shedding.

**Founder.** A disease affecting horses, cattle, sheep, and pigs. Known in veterinary science as laminitis, it is a painful inflammation of the laminæ, or tissues connecting the hoof with the bones of the foot. It is caused by bad management and careless feeding, horses that have much corn and little exercise being apt to develop it suddenly. Indian corn, beans, peas, and barley undoubtedly predispose to this form of fever. In mares it may follow foaling. Treatment consists in a moderately strong purge and blood-letting, and frequent warm bran poultices. The animal may be slung, in order to take its weight off its feet, and if the pain is severe cocaine may be given.

**Founders' Company, THE.** London city livery company, to which ordinances were granted July 29, 1365.

It was formed to ensure that work by foundrymen in the city of London should be only with good metal. It was granted its present charter Sept. 18, 1614. Until 1908 the company had the power to size

and stamp brass weights in the City and 3 miles around. The hall is at 13, St. Swithin's Lane, E.C.; the former hall, still owned by the company, is in Lothbury and is occupied by Brown Shipley & Co., bankers. *Consult* History of the Founders' Company, N. N. Hibbert, 1925.

**Founder's Share.** Class of share granted to the originators of a joint stock company, or to others who have rendered services to it. They are usually few in number and for small amounts, 1s. perhaps; but sometimes they become valuable because they participate in the profits after a certain fixed amount has been reached. The fact that their total amount is small enables a successful business to pay an enormous percentage on such shares. This class of share is rarely issued now, and in some concerns those issued earlier have been bought out and cancelled. *See* Company Law.

**Foundling Hospital.** Charitable institution founded to prevent the murder or exposure of newly born children. Such institutions appear to have been coincident with the development of civilized society, and they undertake the education and training of children until the latter reach maturity. The first step towards avoiding the crime of child murder was the exposure or abandonment of an infant in a public place in the hope that it would be found (hence foundling) and cared for by someone other than the parents. The earliest recorded case of exposure seems to be that of Moses (Exodus 2). Foundlings thus exposed were assigned as property to those who took them under their protection, and provision was made in ancient Greece and Rome for the upbringing of unadopted infants at the expense of the state, an example followed by the French in 1790.

At Trèves cathedral, in the 6th century, foundlings were received and arrangements made for their care under the supervision of the archbishop. The first foundling hospital of which there is authentic record was at Milan towards the end of the 8th century. The Order of the Holy Ghost, founded at Montpellier in the 12th century, made the care of foundlings a special duty. The Spedale degli Innocenti, or Foundling Hospital, at Florence, dates from 1419-51. The Ospedale di S. Spirito, in Rome, founded by Innocent III, included a foundling institution. In 1536 Marguerite of Valois instituted a foundling hospital which was incor-

porated with the great Foundling Hospital in Paris, started in 1670. Foundling hospitals now exist in all the great capitals of the world, though the word foundling does not correctly describe them all.

One of the most interesting of such institutions was that in London. Its founder, Thomas Coram (1668-1751), a captain in the merchant service, and a man of comparatively humble means, advocated his project for nearly 20 years before, in 1739, it was realized. A house was taken in Hatton Garden and opened in 1741 for 20 infants. The later building in Guilford Street, Bloomsbury, dated from 1745, when it had 600 inmates, supported at an expenditure of five times the income. Parliament voted a grant of £10,000, but stipulated for indiscriminate admittance, which had to be abandoned. Since 1760 entry has been limited to illegitimate children who have been deserted by the father, but whose mothers can prove previous good character. Hogarth, one of the earliest governors, began an art exhibition in its rooms which led to the foundation of the annual exhibitions of the Royal Academy. Handel was another tireless benefactor, and from his day the hospital recorded a high musical reputation.

The Bloomsbury site was sold in 1926. The institution became known as the Thomas Coram Schools, Berkhamsted, whither it moved in 1935. *See* N.V.

**Foundry** (Lat. *fundere*, to pour, melt). Term properly referring to the art of casting molten metals into moulds; but more generally used for a building in which metals are founded. Metals have been melted and cast into moulds for over 5,000 years, and many examples of ancient Chinese, Japanese, and Roman castings may be seen in the museums of the world. From them may be obtained an idea of the growth of the art from single castings to modern castings weighing 100 tons or more and mass-produced articles weighing a fraction of an ounce. There are three main classes of foundry: ferrous (cast iron and steel); heavy non-ferrous (such as brass and bronze); and light metals (magnesium and aluminium alloys). But the methods used and principles applied are similar in all.

Essentially founding consists of making some form of patterned hole in sand and filling that hole with molten metal. When the metal cools it freezes, forming a solid replica of the shaped hole.



Founders' Company arms

ter Sept. 18, 1614. Until 1908 the company had the power to size

Further cooling causes contraction of the solid metal, so that the finished casting is slightly smaller than the hole; but otherwise the metal will have taken up the contours of the sand mould, which is then broken away from the casting. Engineers, metallurgists, physicists, chemists, and ceramists help to control and improve the processes, while melters, annealers, pattern- and core-makers are needed in every foundry.

The first item required before founding is a pattern of the same shape as the casting desired. This is prepared from a drawing of the component and may be made of wood, brass, cast iron, or white metal. Moulding technique must also be borne in mind, as the pattern has subsequently to be extracted from the sand without disturbing it. Yellow pine and mahogany are commonly used for wooden patterns. Cast iron is the most common metal used, though its weight sometimes makes it difficult to handle. Plaster of Paris is often used for small castings and for core patterns. Cores are those parts of the mould which must be made in separate sand shapes and assembled in the mould to produce hollows and undercut portions in the casting. Special sands make the moulds, and a great deal of experimental work has been carried out on them.

#### How to Make a Mould

The mould is made in several stages. A suitable moulding box is selected, and the top half is placed on a bench and filled with sand. The pattern is then pressed halfway into the sand, forming a temporary support for the bottom half, which is now placed on top and filled with sand. The boxes are then turned over and the temporary part is removed. The joint is covered with sand which contains no bonding agent, to prevent the two halves from sticking together. The procedure is repeated by putting the top half, or cope, on top and filling. The two halves may then be separated and the pattern removed. Feeders must then be formed to allow the metal to be poured in.

More complicated castings may need several mould boxes, with vents to hold the core in position when a hollow casting is to be made. When a core is used some outlet must be left, not only for the gases, but also for the core itself to be removed subsequently. Very large castings require pits and special structures; often loam, which contains more clay than

normal sands, is used for this work. A large casting may take several weeks to cool. For mass production most of the work of mould manufacture is carried out mechanically.

Furnaces used in foundries vary with the type of material being handled. They range from the huge open hearth and electric arc furnaces used for steel and the cupola for cast iron to the small electric induction and oil-fired furnaces of the non-ferrous industry. Techniques for handling the molten metal differ. Pipe castings are made in large quantities by centrifugal casting, in which the molten metal is thrown to the periphery of the mould by its own centrifugal momentum and solidifies there in an even layer. Die-casting employs metal moulds, which lend themselves to mass production. In general, cast metals are harder and more brittle than those that have been worked, but this result is often altered by heat treatment. See Casting; Furnace.

**Font.** In printing, a term for a supply of type of one size and face, with a distinctive nick. The quantity is ordered according to the number of compositors employed and the class of work for which it is required. For newspapers, an extra quantity of capitals and figures is necessary. With this proviso, a font will contain a standard number of all the letters of the alphabet, graded in bulk according to the occurrence of the letters in the language in which the type is cast. In the U.S.A. the word is spelt font. See Printing; Typefoundry.

**Fountain** (late Lat. *fontana*). Term applied to any construction for the supply of water, from a simple spring to an elaborate artificial basin with ornamental jets. The need of fountains was experienced in Oriental countries at a very early date. Traces of their employment have been found among the relics of the Chaldaean civilization; Pausanias mentions Hellenistic examples; and in ancient Rome they were fully developed as a means of distributing the water brought to the city by the aqueducts. Pliny the Elder notes the construction or repairing of more than 1,200 fountains in Rome alone.

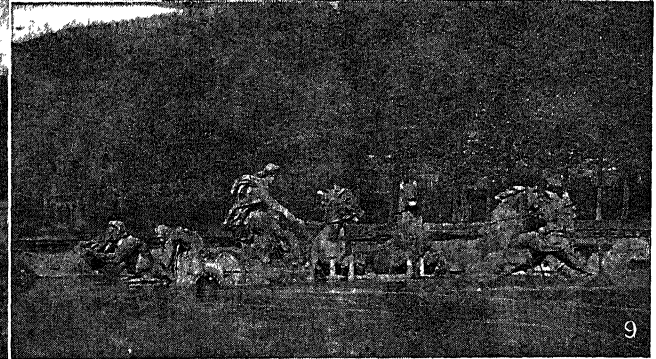
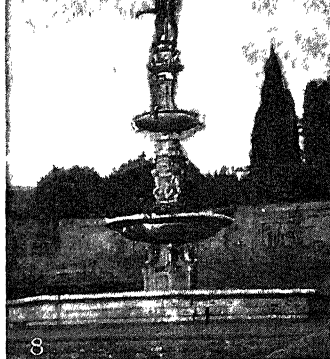
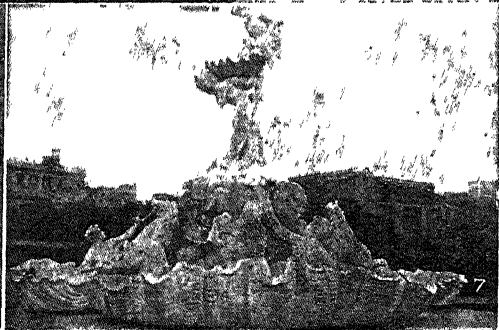
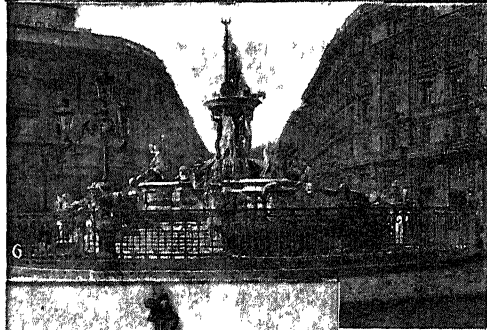
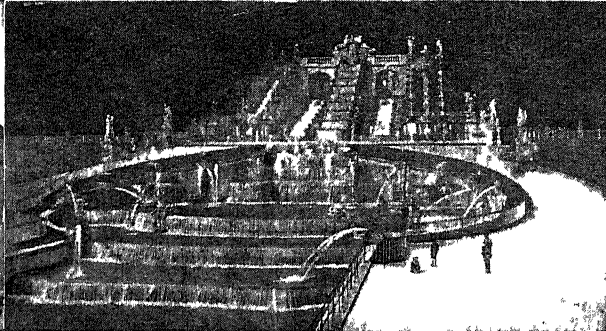
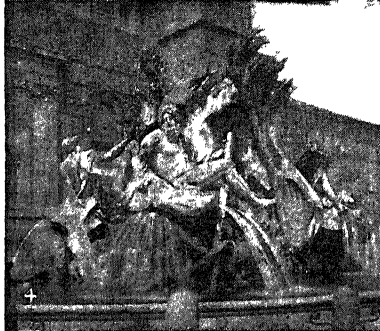
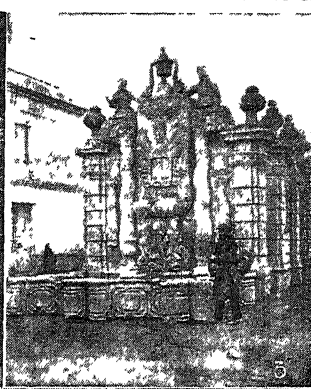
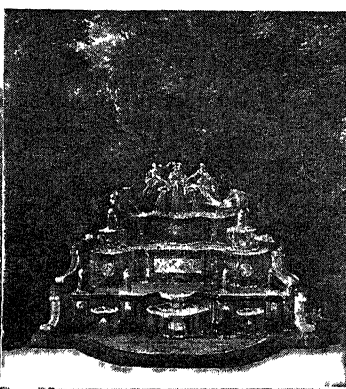
The treatment of fountains was at first purely utilitarian. During the Renaissance, however, the ornate fountain was rapidly developed. The fountains of Berne, each dignified with a name of its own—The Bear, The Ogre, Justice—and the Fountain of the Innocents in Paris (dated 1550) are imposing

architectural structures. The common type of Renaissance fountain was a shallow basin, with a pillar of marble often surmounted by a statue of stone or bronze in the centre, from which projected jets that supplied the running water. The more primitive type was represented by the drinking fountains at street corners. In France, the zenith of fountain-construction was reached under Louis XIV; one may cite the elaborate fountains at Versailles, with their thousands of jets. When the practice of installing a water supply in individual houses was introduced towards the end of the 18th century, utilitarian fountains became rare. But bodies like the Metropolitan Drinking Fountain and Cattle Trough Association, formed in London in 1859, has proved that the demand for this type still exists. Notable ornamental fountains of modern times are the Fontana di Trevi at Rome, and those in the Place de la Concorde, Paris. The illumination of fountains by coloured flood-lighting has proved a popular practice.

**Fountain Pen.** Writing instrument with a reservoir of ink, contained in the hollow penholder, which automatically feeds the nib when the pen is in use, and is so controlled that the ink maintains a steady flow. The first fountain pen was introduced in England in 1835, but was not a success. But in 1884 L. E. Waterman patented his improved fountain pen, and his design continues to be the basis of most types.

The most important part of a fountain pen is the feed bar. A thin channel is grooved along the top of the feed and is in contact with the inner curve of the nib; in the channel are a number of capillary fissures which convey the ink from barrel to point of nib. A small valve in the neck of the barrel admits ink to the feed only when pressure is applied to the nib in the act of writing.

The barrel of the early fountain pen was devoted to the storage of ink, and was filled by means of a syringe. The first self-filling fountain pen had a flexible rubber sac inside the barrel, and attached to the feed assembly. On the outside of the barrel a lever was jointed to a thin strip of metal in contact with the sac; when the lever was raised, the strip of metal was pressed down against the sac, expelling the air. Upon the immersion of the point of the pen in ink, the lever was lowered and the pressure of the metal strip against the sac

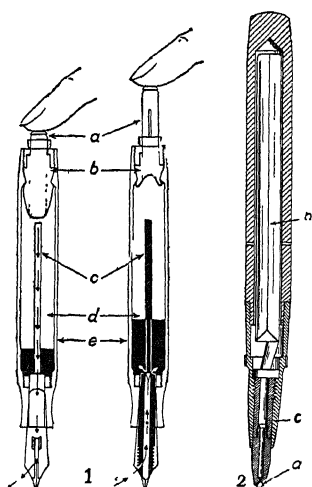


1. Neptune fountain at Bologna, by Giovanni da Bologna, 1563-67. 2. Buffet cascade, Grand Trianon Gardens, Versailles, by Hardouin-Mansart, c. 1688. From an old painting. 3. Fountain of Falling Waters, Mexico City, 1755. 4. Fountain in Piazza Navona, Rome, by Bernini,

c. 1650. 5. Grande Cascade, St. Cloud, c. 1690. 6. Medina fountain, Naples, 17th cent. 7. Marble fountain in the gardens of the Paseo Colon, Buenos Aires. 8. Hercules fountain, Villa Reale di Castello, Florence, by N. Tribolo (1485-1550). 9. Basin of Apollo, Versailles, by Lebrun, c. 1680

# FOUNTAIN: ARTISTIC EXAMPLES FROM GREAT CITIES OF EUROPE AND AMERICA





**Fountain Pen.** Fig. 1. Self-filling pen; a, plunger; b, diaphragm; c, breather tube; d, feed channel; e, barrel. Fig. 2. Pen with rotatable ball, a, instead of a nib; b, reservoir; c, adapter. Arrows show direction of ink flow

released, which then filled with ink by means of suction.

As the chemical constituents of ink corrode rubber, experiments were made to evolve a self-filling fountain pen which did not require a rubber sac. Sacless pens were provided with a piston in the base of the pen which pumped ink into the barrel. As the piston and sleeve were seldom sufficiently airtight, the pen either was not completely filled or else leaked. In 1932 a more efficient self-filler eliminated the ink sac or piston pump (Fig. 1). The pen was filled by pressing and depressing a plunger (a) which in turn caused a synthetic rubber diaphragm (b) to expand and contract. This forced air out of a breather tube (c) and created a vacuum, which drew ink through the feed channel (d) and into the barrel (e).

Barrels and parts are made of vulcanite or plastics, metals being avoided owing to their liability to corrosion. The nib is generally of gold tipped with iridium, the latter a metal least affected by ink.

A later type of fountain pen (Fig. 2) had a rotatable ball (a) in place of a nib. As the ball moved over the paper in the act of writing, its rotation drew ink from the reservoir (b) through the adapter (c). The ink had a high spirit content so that it dried immediately it reached the paper. When empty the pen was recharged with a fresh reservoir of the special ink required.

**Fountains Abbey.** A ruined abbey in the W. Riding of Yorkshire, England. It stands near the little river Skell, 3 m. S.W. of Ripon; it is in the grounds of the mansion of Studley Royal, while near it is a mansion dating from Stuart times, Fountains Hall. The ruins include those of the church with its tower, the former being 380 ft. long, the chapter house, 13th century choir, the magnificent cloisters, and other parts. They are perhaps the most complete in England and, with the possible exception of Tintern, the most beautifully situated. The abbey, a Cistercian house, was a long time in building. Begun about 1132 it was completed 200 years later. The monks came from S. Mary's Abbey, York. The house was dissolved by Henry VIII and the ruins and lands were sold. In the 18th century they were held by the Aislaby family of Studley Royal. In 1946 the Roman Catholic Church proposed to buy the abbey and restore part as a Benedictine monastery, setting up nine altars in memory of English-speaking nations allied in the Second Great War. See *illus. Abbey*, p. 7; *Cloister*, p. 2166.

**Fouqué, FRIEDRICH HEINRICH KARL, BARON DE LA MOTTE (1777-1843).** German author. Born at



**Baron de la Motte Fouqué, German author**

Brandenburg, Feb. 12, 1777, of Huguenot origin, he took part as a cavalry officer in the Prussian campaigns of 1794 and 1813, but literature occupied most of his time. For a while he was the most popular of German story-tellers, but his dependence upon the supernatural militated against a permanent popularity. He is chiefly remembered for his tale of *Undine*, 1811. He died in Berlin, Jan. 28, 1843.

**Fouquet, JEAN (c. 1416-c. 1480).** A French painter, born at Tours. As a portrait painter he was patronized by Étienne Chevalier, treasurer of Charles VII and later of Louis XI. He was one of the greatest French primitives, his best-known works being a Bible, decorated with 150 miniatures, in the Bibliothèque Nationale in Paris; a *Book of Hours*; and nine miniatures of a manuscript of the *Antiquités des Juifs*. Unappreciated for 400 years, his work was displayed in Paris in 1904 and

recognized to be fundamental in the national art.

**Fouquet, NICOLAS, MARQUIS DE BELLE ISLE, VICOMTE DE MELUN ET DE VAUX (1615-80).** French statesman. Born of a noble family in Paris, Jan. 27, 1615, he held posts in the parliament of Paris while still a youth, becoming procurator



**Nicolas Fouquet, French statesman**

general in 1650. In 1653 Mazarin made him superintendent of finances, and Fouquet used his position to make himself one of the wealthiest men in France. He worked to succeed Mazarin, 1661, as the king's chief minister, but Louis XIV, passed him over.

Fouquet built himself a luxurious palace at Vaux, entertaining lavishly and patronizing the arts and letters. But Louis, exasperated by his long mismanagement of the finances and his overweening ambition, had him arrested at Nantes, Sept., 1661. His trial, 1661-64, notorious for its injustice, ended in his imprisonment for life at Pignerol, Piedmont, where he died, March 23, 1680. The theory that Fouquet was the Man in the Iron Mask (*q.v.*) has been proved untenable.

Charles Louis Auguste Fouquet (1684-1761), who conducted a masterly retreat from Prague in 1742 during the War of the Austrian Succession, was a grandson. *Pron. Fookay.*

**Fouquier-Tinville, ANTOINE QUENTIN (1747-95).** French Revolutionist. Born at Hérouel, Aisne,



**A. Q. Fouquier-Tinville, French Revolutionist**  
*From a sketch*

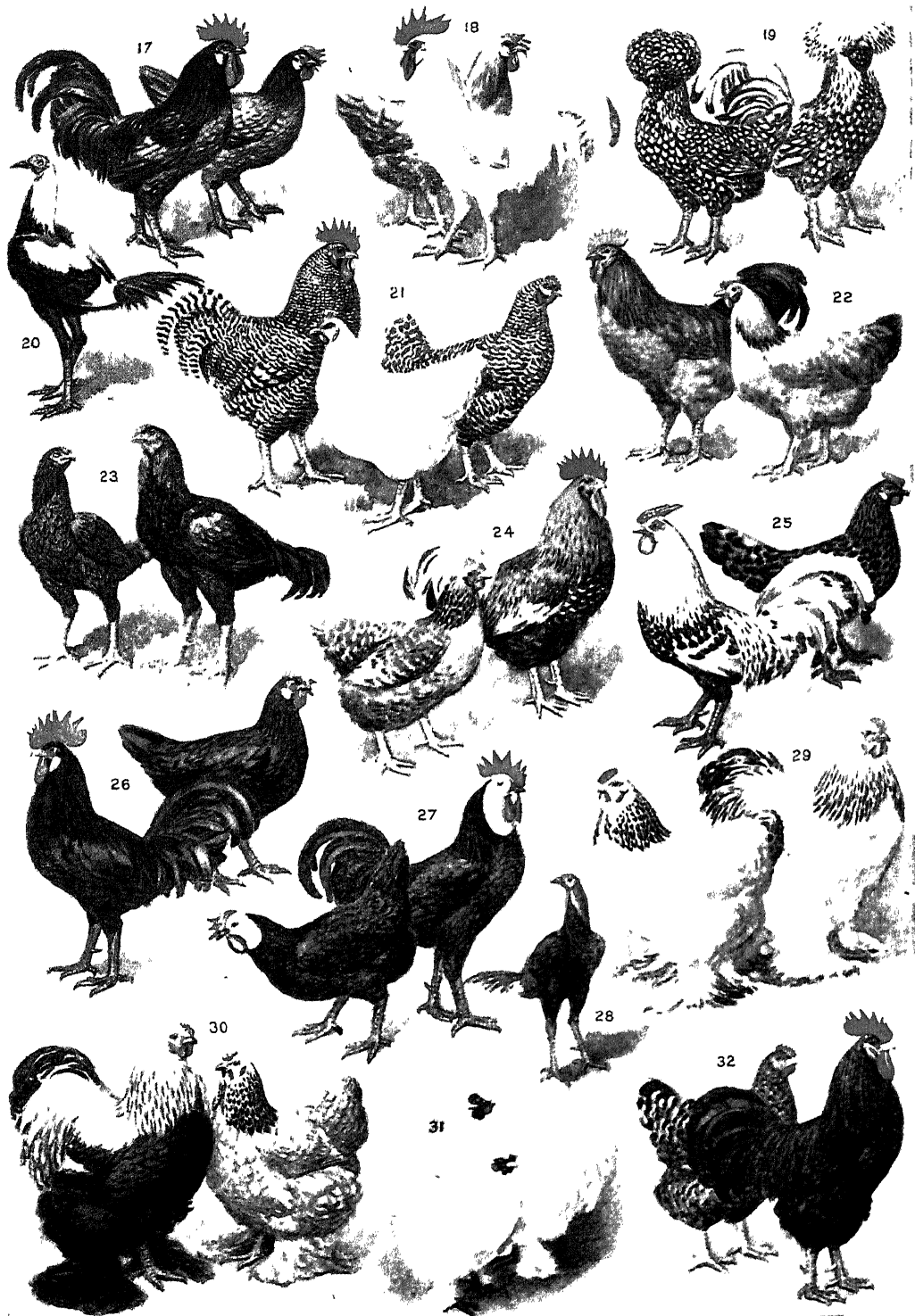
and trained for the law, he came to Paris and entered the secret police in 1783. A violent democrat, he joined the extremist party in the Revolution, and was appointed by Robespierre public prosecutor of the revolutionary tribunal, 1793. Utterly inhuman, he sent men and women of all ages and parties to the guillotine, Bailly, Danton, Robespierre, and St. Just amongst them, but in the reaction from the Reign of Terror he himself was guillotined on May 7, 1795.



1 Houdans 2 Salmon Faverolles 3 Buff Orpingtons 4 Dark Dorkings 5 Silver grey Dorking hen 6 Silver Duckwing Yokohama cock 7 Silver Cam lines 8 Brown Leghorns 9 Golden Stabright laced cock and golden laced hen 10 Bantams

11 Spangled Old English game 12 Modern Langshans 13 Wyandottes, black cock and white hen 14 Hamburgs, black cock and golden pencilled hen 15 Anconas 16 Wyandottes, silver 17 Partridge Cochins

**POULTRY: COMMON VARIETIES AND FANCY BREEDS. See Text, p. 3499**



17 Andalusians 18 Leghorns, white cock and buff hen 19 Polish Silver Spangled 20 Duckwing game cock 21 Barred Plymouth Rocks and white Rock hen 22 Rhode Island Reds 23 Indian game fowls 24 Speckled Sussex 25 Hamburgs, silver spangled cock and golden spangled hen 26 Black Minoras 27 Spanish fowls 28 Black Red Bantam game 29 Light Brahmas 30 Dark Brahmas 31 Silkies 32 Orpingtons, black cock and buff hen

**Fourberies de Scapin**, LES (The Tricks of Scapin). Three-act comedy by Molière. Derived partly from classical and partly from Italian sources, its scene is laid in Naples. Scapin, a servant, a character acted by the author, plays a series of tricks on two fathers, so that their sons may marry the two girls with whom they have fallen in love. The girls prove to be the brides whom the duped fathers had originally had in view.

The play, which has been described by Brander Matthews as a Punch-and-Judy piece for grown-ups, was first produced at the Palais-Royal, Paris, May 24, 1671. Otway wrote an English version, *The Cheats of Scapin*, 1677.

**Fourcroy**, ANTOINE FRANÇOIS (1755-1809). French chemist. Born in Paris, June 15, 1755, he was appointed in 1784 to the chair of chemistry at the Jardin du Roi. At the Revolution he became a member of the committee of public safety, and to his indifference is attributed the execution of Lavoisier. Among his discoveries are adipocere, cholesterin, the double salts of magnesium and ammonium, and pure baryta. He died Dec. 16, 1809.

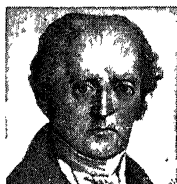
**Four Freedoms**. Term used by the U.S. president F. D. Roosevelt in his message to congress on Jan. 6, 1941. Calling for a new order in international affairs, the president declared that the democratic ideal looked forward to a "world founded upon four essential human freedoms." These were freedom of speech and expression; freedom of every person to worship God in his own way; freedom from want—which meant economic understandings to secure to every nation a healthy peaceful life for its inhabitants; and freedom from fear—which meant a world-wide reduction of armaments so that no nation could commit any act of aggression against its neighbours. The four freedoms formed the basis of the charter of the United Nations drafted at San Francisco in 1945.

**Four Hundred**, TYRANNY OF THE. Oligarchy of nobles established in Athens for four months in 411 B.C. The prime author of the change of government was the exiled Alcibiades (*q.v.*), who knew he could not return to Athens so long as a democratic government was in power; the chief conspirator was Pisander. A reign of terror ensued and the Four Hundred made peace overtures to Sparta. The main Athenian army at Samos was furious, and the people at home, disgusted with the oppressive

measures and pro-Spartan sympathies of the Four Hundred, took matters into their own hands, and restored the democracy.

In 1890 Ward McAllister of New York happened to remark that about 400 people belonged to the best social circle in that city. The "four hundred" soon came into popular use to denote the smart set of any American city, whatever its supposed number.

**Fourier**, FRANÇOIS CHARLES MARIE (1772-1837). French Socialist. Born at Besançon, April 7,



F. C. Fourier,  
French Socialist

1772, the son of a well-to-do tradesman, having lost his inheritance in business, he served two years in the Revolutionary army, and then became a commercial traveller. He set himself to evolve a new social system in a series of works, the chief of which are *Theory of the Four Movements*, 1808, and *The New Industrial World*, 1829. He died Oct. 8, 1837.

Fourier's ideas attracted little attention during his lifetime, but were much discussed in the U.S.A., 1840-50. Several communities, notably those of Brook Farm (*q.v.*) and Red Bank, were established to put them into practice, but met with little success. Fourier's theory was that, man being essentially a gregarious animal, the population should be redistributed in a number of new social units, *phalanges*. Each *phalange* was to consist of 1,500 to 1,800 people, housed in a common building or *phalanstère*, with a square league of land attached; was to be industrially complete in itself and self-governing. Each worker was to receive a minimum wage, and the surplus was to be distributed thus: five-twelfths to labour, three-twelfths to talent, four-twelfths to capital.

**Fourier**, JEAN BAPTISTE JOSEPH (1768-1830). French mathematician and physicist. Born at Auxerre, March 21,



J. Baptiste Fourier,  
French mathematician

1768, he took an active part in the Revolution in that district. Later he accompanied Napoleon on his Egyptian expedition, and was made governor of

Lower Egypt. On his return to France he carried out experiments on the propagation of heat. His *Théorie Analytique de la Chaleur*, 1822, was based on Newton's Law of Cooling, and contains an account of the mathematical series (*v.i.*) by which he is chiefly remembered. Fourier died May 16, 1830.

**Fourier Series**. A trigonometrical series, involving sines and cosines of simple multiples of a variable which is restricted in possible value between definite limits. Such a series, named after J. B. J. Fourier, is of value in the solution of many problems in physics.

**Four Lakes**. Name given to a series of four lakes in Wisconsin, U.S.A. They are the Mendota, Monona, Waubesa, and Kegonsa, and are situated in the S. part of the state. Occupying an area of 225 sq. m., they are drained to the Rock river, by the Yahara river, and are navigable by steamers.

**Foursquare Gospellers**. Popular name for an evangelical religious sect, whose activities are described under *Elim Movement*.

**Fourteen Points**. Proposals made by President Wilson for the satisfactory conclusion of the First Great War. They were contained in an address to congress on Jan. 8, 1918, and in brief they were: (1) Open covenants of peace openly arrived at. (2) Freedom of the seas. (3) Removal of economic barriers between nations. (4) Guarantees that national armaments should be reduced to the lowest point consistent with domestic safety. (5) Adjustment of colonial claims upon the principle that the interests of the populations concerned must weigh equally with the claims of the government whose title to sovereignty was to be determined. (6) Evacuation of all Russian territory. (7) Evacuation and restoration of Belgium. (8) Freeing of all French territory, and of Alsace-Lorraine. (9) Readjustment of the frontiers of Italy along lines of nationality. (10) The peoples of Austria-Hungary to be accorded opportunity for autonomous development. (11) Evacuation and restoration of Rumania, Serbia, and Montenegro. (12) The Turkish portions of the Ottoman Empire to be assured a secure sovereignty, the other nationalities under Turkish rule to be given opportunity of autonomous development. (13) An independent Polish state, with access to the sea. (14) Formation of a league of nations.

The Fourteen Points were accepted in the autumn of 1918 by

the Central Powers when defeat was staring them in the face, and most of them were incorporated in the peace treaties. Later the Nazis maintained that the non-fulfilment of certain points, in particular No. 4, justified their repudiation of the Versailles settlement.

**Fourteenth Army.** A British formation of the Second Great War; the principal Allied fighting formation in the Burma campaign (*q.v.*). Its existence first became generally known on Jan. 11, 1944, though it had been formed three months previously from India's Eastern Army, after the retreat through Burma up to and beyond the Indian frontier, and its c.-in-c., Lt.-Gen. W. J. Slim (*q.v.*), was already planning to take the offensive under the orders of Gen. Sir George Giffard, c.-in-c. 11th army group. The army sign incorporated a sword, the hilt of which, S-shaped, was a reference to its commander's name. The high-level organization changed in Nov., 1944, when Lt.-Gen. Sir Oliver Leese arrived to take over Giffard's command, subsequently designated Alsea (Allied Land Forces, S.E. Asia).

Three Indian army corps were directly concerned in the Burma campaign—4th, 15th, and 33rd—and at various times 14 divisions served in Slim's command: 2nd and 36th British; 3rd (Chindits), 5th, 7th, 17th, 19th, 20th, 23rd, 25th, and 26th Indian; 11th East African; 81st and 82nd West African. In addition there were Burmese forces, Lushai brigade, Kachin Levies, and other irregulars, and the total man-power at one time reached over 1,000,000—the largest single army of the war, holding the longest front (from the Bay of Bengal to the Chinese border), and with perhaps the most varied composition.

Although British troops, principally infantry, formed one-third of each Indian division, and also provided the officers and n.c.o.s of the African formations, Indian, Gurkha, and African troops had a large share in the 14th army's remarkable history.

Air supply was gradually built up until the whole of the great force was being fed and equipped by "air-drop," the British, U.S., and Canadian transport squadrons concerned carrying on courageously even in the worst monsoon conditions. Close air support to forward troops and evacuation by air were extensively practised, and the army and air headquarters worked together as a team. In the

later stages, while the 4th and 33rd corps advanced through central Burma, the 15th, in Arakan, was detached under direct command of c.-in-c. Alsea, and the 36th division fought in the northern (U.S.-China) combat area.

After the reoccupation of Rangoon in May, 1945, 14th army H.Q. was moved back to India to direct the invasion of Malaya and the East Indies. A new Indian corps, the 34th, was destined as the spearhead of this operation. Following the establishment of his new H.Q. in Singapore in Sept., Gen. Slim handed over command to Gen. Sir Miles Dempsey (*q.v.*). On Dec. 1, 1945, the 14th army was disbanded. Official figures showed that, in its two years' existence, the 14th army had killed a total of 120,000 Japanese for a loss of only 17,000, despite a fanatical enemy, lack of equipment, appalling climate, and a heart-breaking terrain.

G. D. H. Linton

**Fourth.** Musical interval which includes four consecutive scale names, *e.g.* C, D, E, F. The interval between C and F is called a fourth, and as F is the fourth degree of the scale of C this is called a perfect fourth, and by some a major fourth. *See* Interval.

**Fourth Dimension.** (1) Term used in mathematics to express the degree of an item. Thus  $abcd$ ,  $a^4$ ,  $a^2b^2$ , are all of the fourth dimension or degree because they are products of four factors.

(2) A quantity is of the fourth dimension when its expression involves four fundamental measurements; *e.g.* the statement of the heat conductivity of a substance

needs four fundamental dimensions, mass, length, time, and temperature.

(3) The term has been used particularly in connexion with various systems of geometry, elaborated principally in the 19th century by Riemann, Cayley, Minkowski, and others. Some of these geometries incorporate time as an essential dimension of space (or space-time) and deny certain fundamentals of ordinary (or Euclidean) geometry, such as the ideas concerning parallel lines; others were based on the line as the unit measurement instead of the point; others attempted a spatial interpretation of relationships between lines, points, surfaces, and solids in theoretical space of  $n$  dimensions. These geometries helped greatly in the "geometrisation of physics" and the development by Einstein and others of the theory of relativity. *See* Mathematics. *Consult* also The Fourth Dimension, C. H. Hinton, 1904; Geometry of Time and Space, A. A. Robb, 1936; Physics and Experience, B. Russell, 1946.

**Fourth Estate.** Term sometimes applied to the press to emphasise its importance in the state, the three estates of the realm according to the constitution being the lords spiritual, lords temporal, and commons. The term was first used by Edmund Burke.

**Fourth of June.** Speech day and holiday at Eton College. The anniversary of the birthday of King George III is the principal celebration at Eton and is attended by boys' relatives and Old Etonians. In the morning a master calls "absence," when every boy must answer his name, this ceremony being followed by speeches

in Upper School. Cricket matches are played, and in the evening a firework display and a procession of decorated boats terminate the celebration.

**Fourth Party.** Name given about 1880 to a small independent and irresponsible body of Conservative politicians. The leading men were Lord Randolph Churchill, Sir H. Drummond Wolff, Sir John E. Gorst,



Fourth of June. "Absence" being called during the annual celebrations on this day at Eton College

and at times A. J. Balfour. Throughout the parliament of 1880-85 they frequently opposed and harassed the Conservative leader of the commons, Sir Stafford Northcote.

**Four-Year Plan.** Name given to two programmes of economic development in Nazi Germany. Hitler announced the first four-year plan in May, 1933—ostensibly a modest scheme for housing, road construction, and other public works. This work was executed, but served really as a façade behind which the rearming of Germany had begun. The second plan covered the years 1937-40 and was concerned with the development of substitute materials with a view to attaining self-sufficiency. It referred especially to oil from coal, synthetic rubber, artificial textiles, and the exploitation of Germany's ore reserves. Self-sufficiency had not been achieved in any field when Hitler launched the Second Great War in 1939.

**Fowey.** Seaport, market town, and watering place of Cornwall, England. It stands on the W. shore of the Fowey estuary, 10 m. S. by E. of Bodmin, on the railway. It has a fine harbour, formerly protected by three forts now in ruins, and is a favourite holiday resort and yachting station. A leading port in the Middle Ages, it supplied nearly 50 vessels for the blockade of Calais in 1346. There is a trade in china clay. Sir A. Quiller-Couch, long a resident, put Fowey into his novels as Troy Town. Market day, Sat. Pop. 2,382. *Pron.* Foy.

**Fowl** (A.S. *fugol*, bird). Name formerly meaning any bird, now applied to the various species of the genus *Gallus* of the pheasant family of the zoological order Gallinae, to which the game birds generally belong. Most of them have handsome plumage and strong legs, being better adapted for running than for flight. They range in size from the quail to the turkey, are mixed feeders, and are all valued for the table.

The many varieties of domestic fowl are certainly descended from the wild jungle fowl of India. The jungle fowl, which flourishes well in captivity, breeds freely with the domestic varieties, and the hybrids are always fertile. There is no record of the original domestication of the jungle fowl. It is possible that the bird was caught in greater numbers than were required for food at the moment, and that it was then found possible to keep it for a time in captivity, where it bred,

this suggesting a means of multiplying and maintaining a supply of food always at hand.

There is no trace of the fowl among the remains of birds and animals found in the kitchen middens of the Neolithic period, and it does not appear to have been known to the Greeks of the Homeric age. But it is mentioned in a Chinese encyclopedia compiled about 1400 B.C., though it is not clear if the wild or the domesticated bird is meant. There are, however, records in the code of Manu of cock-fighting in India about 1000 B.C., and this makes it probable—though not certain—that domestication had taken place at an earlier date. It is curious that the spread of the domesticated fowl westwards was due to the love of cock-fighting rather than to any appreciation of the value of the bird as an article of food. Aristotle in his *History of Animals* mentions the domestic fowl and gives various details of its habits and laying powers; but there is no mention of domestic fowls in the Old Testament of the Bible.



Fowey. Picturesque seaport on the south Cornish coast, the "Troy Town" of "Q's" novels; it lies on the W. shore of the Fowey estuary

It is not known when the bird first reached Great Britain, the statement that it was brought by the Phoenicians being pure speculation. It is thought that the breed now known as Dorkings was introduced by the Romans, but here again decisive evidence is lacking. But cock-fighting was popular in Britain many centuries back, the earliest definite record dating from the reign of Henry II, when William FitzStephen wrote an account of the cock-fights that took place in schools on Shrove Tuesday.

Crossing between breeds of domesticated fowl has happened to such an extent that the parent breed is obscure. Sex is shown by

colour, but in only one way, namely, a brown cock crossed with a grey hen will produce grey male chicks and brown female chicks. No such differentiation occurs when a grey cock is crossed with a brown hen.

The best breed or strain varies with the purpose for which the bird is required—for egg production, for table quality, or for ornament. Egg production does not as a rule help the eating quality of the flesh, and breeding for eggs or meat will prevent ornamental development. Female birds up to twelve months old are called pullets, from 12 to 24 months yearlings, and only at 24 months old become hens. They begin to lay at five to six months.

Egg-producing birds tend to be small, seldom exceeding 7 lb. in weight. Average annual production of a good bird is 150-200 eggs. The Rhode Island Red, the Wyandotte, the Sussex, the Leghorn, and the Buff or Plymouth Rock are the principal laying breeds, and it is mainly with these breeds that experiments in crossing have been made.

The pullet produced by crossing a Black Leghorn cock with a Rhode Island Red hen is black tinged with red and is an excellent layer, but the offspring of a Rhode Island Red crossed with a Light Sussex hen is a much better table bird.

The Rhode Island Red is usually chestnut in colour with yellow legs and orange eye. The Light Sussex is white with a black tail. Both are good table birds. The White Leghorn and the Black Leghorn are very good layers but poor table birds. The Buff Rock and the White Wyandotte are heavier birds and suitable for the table. Orpingtons, Minorcas, Brahmas, and Cornish are also



bred for the table, the first two being white skinned. See col. plates facing pp. 3496-97; also Poultry.

**Fowler, ALFRED** (1868-1940). British astronomer and spectroscopist. Born on March 22, 1868, in Yorkshire, he studied astrophysics at the Royal College of Science under Lockyer. On the removal of the Solar Physics Observatory to Cambridge in 1901, he was appointed assistant professor of astrophysics and founded at S. Kensington a unique laboratory in which the spectra of astronomical bodies were reproduced and identified. He took part in six eclipse expeditions, photographing for the first time the flash spectrum (*q.v.*) and making the first accurate measurements in the spectrum of the corona. His spectroscopic work formed the observational basis for Bohr's theory of atomic structure. Fowler was president of the Royal Astronomical Society, 1919-21, F.R.S. from 1910, and created C.B.E. in 1935. He died June 24, 1940.

**Fowler, ELLEN THORNEYCROFT** (1860-1929). British novelist. She was a daughter of the 1st Viscount Wolverhampton and married A. L. Felkin in 1903. She died June 21, 1929. Most of her stories, which include *Concerning Isabel Carnaby*, 1898; *A Double Thread*, 1899; *The Wisdom of Folly*, 1910, reflect life in the English Midlands under Methodist influence.

**Fowler, HENRY WATSON** (1858-1933). English lexicographer. He was born at Hinton St. George, Somerset, March 10, 1858, and became a master at Sedburgh in 1882. He retired in 1889 and lived quietly until 1915, when he joined the British army in France in his 57th year. At the end of the First Great War he returned to his researches and died Dec. 26, 1933.

Fowler was one of the most remarkable scholars of his day and had the ability to endow his pronouncements with persuasive charm and finality. At first in collaboration with his brother, F. G. Fowler, and later by himself he produced a series of textbooks which became oracles in the determination of correct English. A highly praised translation of Lucian appeared in 1905; *The King's English* in 1906. The brothers produced the *Concise Oxford Dictionary* in 1911, and after his brother had been killed, Henry continued the *Pocket Oxford Dictionary*. His supreme achievement was *A Dictionary of Modern*

English Usage, 1926. Two revealing books in 1929 were *If Wishes Were Horses*, and *Some Comparative Values*.

**Fowler, SIR JOHN** (1817-99). A British engineer. Born July 15, 1817, he became a civil engineer and was employed in railway schemes which accompanied the boom of 1846. Pimlico Bridge was built according to his designs in 1860. The same year he was engaged in the construction of the Metropolitan rly., opened 1863. In 1869 he was consulted by Ismail Pasha with regard to engineering schemes in Egypt. In 1883, in partnership with Benjamin Baker, he designed the Forth Bridge, which was opened in 1890. For this Fowler, who had been knighted in 1881, was made a baronet. He died March 27, 1899.

**Fowler, WILLIAM WARDE** (1847-1921). British scholar and ornithologist. Born May 16, 1847, son of a Swansea magistrate, he was elected to a fellowship at Lincoln College, Oxford, in 1872, becoming sub-rector ten years later. His volume on *Julius Caesar*, in 1892, was the first of a series of classical studies. His books on bird life added much to existing knowledge, the best known being *A Year with the Birds*. He died June 14, 1921. *A Life*, by R. H. Coon, appeared in 1934.

**Fowler-Dixon, JOHN EDWIN** (1850-1943). British athlete. Born Sept. 3, 1850, he devoted himself to athletics, and in 1877 won the 50 miles and the 100 miles amateur walking records. In 1884 and 1885 he created 50 miles running records of 6 hrs. 20 mins. 47 secs. and 6 hrs. 18 mins. 26 secs. respectively. In the former year he also made the 40 miles running record of 4 hrs. 46 mins. 54 secs., which had not been beaten when he died, Oct. 10, 1943. Proprietor of the *Athletic News*, he helped to found the Amateur Athletic Association, whose trophy for the two miles walk perpetuates his name.

**Fowler's Solution.** Popular name for *liquor arsenicalis*. It is a 1 p.c. solution of arsenious acid in water with small amounts of potassium carbonate and compound tincture of lavender, used occasionally in medicine, chiefly in morbid conditions of the blood.

**Fox.** Animal belonging to the genus *Vulpes*, probably consisting of only one species including several local races. It differs from dogs in the shape of its skull, and in the fact that the pupil of the eye is elliptical instead of circular. It is of slim build, with long bushy tail and rather long ears.

Foxes feed upon small mammals and birds, but also eat insects and fruit, feeding by night and spending the day in burrows, hollow trees, and clefts in rocks. They are found nearly everywhere throughout the northern hemisphere; and

the common fox (*Vulpes canis*) is a well-known inhabitant of Great Britain. It is reddish-brown in colour, with white beneath; but the hue varies considerably in local races, as in the so-called greyhound fox of the Lake District. It sometimes makes its own burrow, though it usually adapts that of the badger or rabbit.

In the summer it often sleeps in a dry ditch. The young, usually four or five in number, are born about April.

The fox is valued for its fur, especially that of the black and silver varieties. It is a favourite animal for hunting, but often works havoc in game preserve and poultry yard. It would have become extinct in Great Britain long ago but for its preservation by the hunts. See *Fur*.

**FOX OR NEENAH.** River of Wisconsin, U.S.A. Rising in the S. part of the state, it flows S.W. N., and N.E. to Lake Winnibago. Emerging from the N. end of that lake, it follows a N.W. course to Green Bay, a branch of Lake Michigan. In its upper reaches, near Portage, it is connected by a canal with Wisconsin river. It is 250 m. long, and navigable for most of its course.

**FOX OR PISHITAKA.** River of the U.S.A. Rising in Wisconsin, it flows 225 m. generally S. and S.W., and passes through Illinois to unite with the Illinois river at Ottawa.

**FOX.** Channel of N. America. It lies to the N. of Hudson Bay, separating Baffin Island on the E. from Melville Peninsula and Southampton Island on the W. It communicates by Hudson Strait with the Atlantic, and by Fury and Hecla Strait with the Arctic. Luke Fox, English navigator, explored it in 1631.



Fox. Common fox, *Vulpes canis*, emerging from its earth

**Fox, Sir Charles** (1810-74). British engineer. The son of Francis Fox, M.D., he was born at Derby, March 11, 1810. Having shown a distinct gift for mechanics, he was articled to an engineer, and was soon associated with Robert Stephenson and other pioneers of the steam engine. He did engineering work on various rlys., especially the London and Birmingham, and the firm of which he became a partner began to make rly. stock, introducing therein various improvements suggested by him. Fox built the Crystal Palace in Hyde Park and afterwards at Sydenham, and was very successful with his bridges. An enormous length of rly. line, almost in every part of the world, was undertaken by his firm, as well as tunnels, stations, among them Waterloo, Paddington, etc. In 1851 he was knighted. He died June 14, 1874, leaving his two elder sons to carry on the business of Sir Charles Fox & Sons.

**Fox, Sir Charles Douglas** (1840-1921). A British engineer. Born May 14, 1840, educated at Chalmers School and King's College, London, he joined his father, Sir Charles Fox, in business in 1861. Associated with him in railway and other engineering work, he soon came to the front. He was president of the Institute of Civil Engineers, and in 1886 was knighted. He died Nov. 13, 1921.



Sir C. Douglas Fox,  
British engineer  
Russell

A brother Francis (1844-1927) joined the firm 1861, being knighted in 1912. Sir Francis was called in to advise on the restoration of Winchester Cathedral, and was one of the experts consulted about the construction of the Simplon Tunnel. His published books include *The Mersey Tunnel* and *The Simplon Tunnel*. He died Jan. 7, 1927.

**Fox, Charles James** (1749-1806). British statesman. Born in London, Jan. 4, 1749, he was a younger son of Henry Fox, Lord Holland; his mother was a daughter of the duke of Richmond. He was educated at a school at Wadsworth, at Eton, and at Hertford College, Oxford. He read widely, and his industry, coupled with his great natural abilities, made him a scholar. In addition to a knowledge of the classics, he was a good French scholar and read Italian well. He was only a boy when,



C. J. Fox

(after Reynolds)

encouraged by his father, he began his career as a gambler and shared the other pleasures of his dissolute elders. In 1769 he entered parliament as M.P. for Midhurst, his father's pocket borough, and in 1770 he was made a junior lord of the admiralty under Lord North. In 1772 he resigned owing to his opposition to the court, but in 1773-74 he was again in office as a junior lord of the treasury.

Fox's career as a Whig leader may be dated from 1775. By then he had won the friendship of Burke, and had shown, in the case of the American colonics, for instance, that attachment to the cause of popular liberty which is the outstanding feature of his political career. He acted with the Whigs, then led by Lord Rockingham, but in many matters he was more advanced than they. His creed included parliamentary reform and purity in financial affairs, while, like many others, he saw a danger to the state in the undue influence of the crown. Soon came his advocacy of the repeal of Roman Catholic disabilities and of the causes of Ireland and the slave.

In 1782 Fox entered the cabinet of Lord Rockingham as secretary of state, but in a few months the premier died, and, refusing to serve under Lord Shelburne, he joined Burke and Sheridan in a Whig secession which in 1783 resulted in the extraordinary coalition between Fox and Lord North. In this the former was again a secretary of state, but this ministry had but a brief life. It was dismissed by the king as soon as the house of lords had rejected Fox's India Bill.

Fox, who in 1784 had fought at Westminster—for which constituency he had been first returned in 1780—one of the most fiercely con-

tested battles in electoral history, now appeared as a leading opponent of Pitt's ministry, although on some matters—the impeachment of Hastings, for instance—he was in agreement with the premier. In 1789 came his famous declaration of welcome to the French Revolution, an encomium on the fall of the Bastille, and in 1791 his long friendship with Burke came to an end on this issue. By 1792 the majority of the Whigs had ceased to hail the Revolution with rapture, regarding it rather as a tyranny; but Fox, almost alone, continued to support it. He declared against the war with France, but by now he had few followers, and after 1797 he ceased for a time to attend parliament. In 1798, for declaring publicly for the sovereignty of the people, his name was removed from the list of privy councillors.

About 1802 Fox returned to public life. He remained in opposition until the death of Pitt in 1806, when he again became a secretary of state, this time in the ministry of all the talents. He then endeavoured to negotiate a peace with France, but he soon realized that he had misread Napoleon's character. His health was already failing, and on Sept. 13, 1806, he died at Chiswick. He is buried in Westminster Abbey.

The vices and the virtues of Fox were both on the large scale. A leading member of the dissolute circle that surrounded the Prince Regent, he lost an ample fortune at cards, and was more than once bankrupt, dependent upon the charity of his friends. He showed, as did others, a lack of consistency between words and deeds, while he was capable of carrying his private animosities into public life. For constructive statesmanship he showed no ability whatever. On the other hand, he was a great orator and a greater debater. To the last his mind maintained its freshness by contact with the masterpieces of literature. He possessed a really generous nature, while his sympathy with the oppressed was the outcome of genuine feeling. He was long the idol of the Whigs, among whom his is undoubtedly the greatest name. In 1785 he married his mistress, Mrs. Armistead, and his later life was passed at St. Anne's Hill, near Chertsey. He began a life of James II, was something of a sportsman, and had fought a duel. See Pitt.

A. W. Holland

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C. J. Fox, Sir G. Trevelyan, 1880; Charles James Fox, J. le B. Hammond, 1903; The Holland House Circle, Lloyd Sanders, 1908.

**Fox, Frederick** (1888-1945). British jockey. He served his apprenticeship with F. Pratt and rode his first winner at Warwick, April 8, 1907. He was champion jockey in 1930 with 129 winners, and Cameronian gave him his first success in the Derby in 1931. In 1935 Fox won the 2,000 Guineas and the Derby on Bahram, and rode as first jockey for George V, retiring at the end of 1936. He was killed in a motor accident, Dec. 12, 1945.

**Fox, George** (1624-91). Founder of the Society of Friends (*q.v.*). He was born at Drayton-in-the-Clay



George Fox,  
English Quaker

(now Fenny Drayton), Leicestershire, in July, 1624, son of Christopher Fox, a weaver, called by his neighbours "righteous Christer." His early bent towards religious

study suggested to his relatives that he should be made a priest. He was, however, apprenticed to a shoemaker and grazier in Nottingham. At the age of 19 he began a series of solitary wanderings in which he sought peace of mind from both churchmen and non-conformists, finally to decide that the one great qualification for the ministry was the presence of God in the heart—the inspiration of the Inward Light.

In 1648 he began to preach in public, adopting the terms "thee" and "thou," opposing many social conventions as well as ecclesiastical formalism, refusing to take oaths, condemning war, and advocating a rigid simplicity of dress. By 1658 communities of his followers were established in all parts of England. Founder and followers were, however, bitterly persecuted, Fox going to prison eight times. When in 1650 he bade the magistrates "tremble at the word of the Lord," he earned for his sect the nickname of Quakers.

In 1669 he married Margaret Fell, of Swarthmore Hall, widow of a judge and one of his early converts. He visited Scotland, 1657; Ireland, 1669; North America and the West Indies, 1671-72; and Holland, with Penn and Barclay, 1677 and 1684. Shortly after a meeting at the Friends' Meeting House, Gracechurch Street, Lon-

don, he died close by in White Hart Court, Jan. 13, 1691, and was interred in the Friends' Burial Ground, Bunhill Fields.

A man of sterling character whose practical gifts were displayed in the organization he gave to the society he founded, his voluminous writings are now seldom read, with the exception of his Journal, which, revised by a committee under the superintendence of Penn, first appeared in 1694. The MS. was sold at Sotheby's, July 26, 1920, for £1,750, and is now in the possession of the Society of Friends.

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**Fox or Foxe, Richard** (c. 1448-1528). English statesman and prelate. Born at Ropesley, Lincs, the son of a yeoman, he was for periods at both Oxford and Cambridge. In 1485, in France, he entered the service of Henry VII. He began as the king's secretary, but was soon lord privy seal. Already ordained, and vicar of Stepney, he was made bishop of Exeter in 1487; in 1492 he was translated to Bath and Wells, and in 1494 to Durham. From 1501 until his death he was bishop of Winchester.

Fox was Henry's chief adviser, and most of the diplomatic work passed through his hands, including the momentous marriage and commercial treaties of this reign. Soon after the accession of Henry VIII, however, he lost his power. He was too steeped in the peaceful traditions of Henry VII to approve of the spirited foreign policy of the new era. Wolsey was too strong for him, and he resigned the privy seal in 1516. He died at Winchester, Oct. 5, 1528, being buried in the cathedral. Fox's great work was the foundation of Corpus Christi College, Oxford. At Cambridge he was chancellor and master of Pembroke Hall.

**Foxe, John** (1516-87). English martyrologist. Born at Boston, Lincs, and educated at Oxford, he was a fellow of Magdalen, 1539-45. He was a tutor in the Lucy family at Charlecote, and in the Howard family at Reigate. During Mary's reign he lived on the Continent, where he met Knox and other reformers, publishing in Latin at Strasbourg the first draft of his Acts and Monuments, familiarly known as Foxe's Book of Martyrs. On Elizabeth's accession Foxe

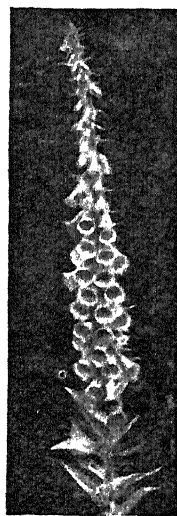
returned to England, was ordained priest by Grindal, lived in Grub Street, and worked on his Acts and Monuments, published in folio by John Daye, 1562-63. He became prebend of Salisbury and vicar of Skipton, 1563; and preached at Paul's Cross. He died April 18, 1587, and was buried at S. Giles's, Cripplegate. His principal work was a great favourite with Bunyan, greatly influenced the progress of Protestantism in England, and, although bitterly prejudiced, is an example of vivid prose.



John Foxe,  
English martyrologist

**Foxer.** Anti-submarine device used in the Second Great War. In 1943 German U-boats began firing a torpedo that could "home" on the noise of a ship's propeller and chase its victim before striking. A foxer was employed to upset the "brain" of this acoustic torpedo; a noise-maker which was towed astern of a ship and acted as a decoy. Not a single ship was sunk while using it.

**Foxglove.** Hardy biennial and perennial plants of the family Scrophulariaceae and genus *Digitalis*. Only one is a native of Great Britain, though there are a number of other species, the majority of botanical value only, which were introduced from Asia and Europe. Their height is from 2 ft. to 5 ft., and their flowers are purple, pink, white, yellow, or brown. They are raised from seed sown in gentle heat in May,



Foxglove. Flower  
of *Digitalis purpurea*

the plants being moved to the open air as soon as they are large enough to be shifted with safety. In sheltered shrubberies and copses a little seed may be sown annually. In mixed borders foxgloves should be placed at the back, in associa-

tion with delphiniums, hollyhocks, sunflowers, and other tall-growing subjects. The wild purple foxglove of our lanes and woods is *D. purpurea*. See Digitalis.

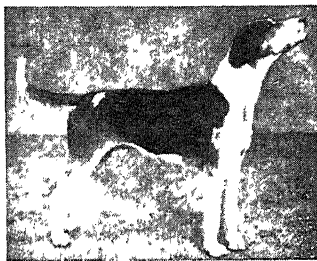
**Foxhound.** Breed of hound specially maintained for hunting the fox. Of mixed origin, it is generally believed to be descended from the old type of bloodhound and the pointer, with perhaps a dash of the bulldog strain. Fox-hunting dates from the days of Edward I, but the dogs then used were entirely different from the present breed of hounds, which is probably not more than 300 years old. The breed has received much attention, and such packs as the Belvoir and the Quorn are of world-wide fame.

The foxhound is notable for its speed and endurance, having been known to follow the fox for ten hours. A good foxhound should stand about 24 ins. high at the shoulder, but the females are usually 3 ins. shorter. The head should be large and full, the nostrils wide open. The short, rounded shape of the ear is the result of cropping when a puppy, and is intended to prevent the ears from being torn when going through thick cover. The back and shoulders should be strong and muscular, the hind quarters well formed, and the legs straight. The coat, always parti-coloured, should be short, thick, and smooth. See Dog.

**Foxhunting.** Sport of the English countryside in which a fox is hunted, with intent to kill, by the aid of a pack of specially bred and trained hounds called foxhounds. Probably the Bilsdale in Yorkshire (the duke of Buckingham, *circa* 1670) and the South and West Wilts (Lord Arundell of Wardour, 1690-1700) are the oldest packs of foxhounds. In the early days of foxhunting, great landowners kept packs of hounds, their kennels being moved from place to place, which hunted over immense areas, later hunted by several recognized packs. Hunting was a slow and laborious process, the foxhunter starting at daybreak and laying his hounds on to the drag of the fox which was then hunted steadily up to where he had laid up for the day. Roused, the fox was then worn down in a long and slow hunt of many hours. An increase of pace began in the Quorn country about 1750 under the aegis of Hugo Meynell, and also in the Pytchley, then controlled by the Lord Spencer of the day. Hounds began to be bred for speed, and the thoroughbred

was introduced into the hunting-field, an innovation not favoured even as late as the 1840s. A hundred years later the half-bred horse was commonly ridden.

With the enclosure of common lands, jumping became fashionable, and others besides the rural population became interested. The repeal of the corn laws, causing the change of so many tilled fields to pasture—particularly in the Midlands where the fashionable packs are to be found—was a final factor which encouraged speed. The heyday of fast hunting



**Foxhound.** Hound from the kennels of the Oakley foxhounds

in "the shires" was from the 1870s until the First Great War, when a very fast horse which could jump whatever in reason came in its way was essential to the ambitious follower of the hunt.

Long hunts were still not uncommon even as the pace increased, and points (*i.e.* the farthest straight distance from "find" to "kill") of anything up to ten miles were frequently made, while the distance "as hounds ran" was nearly always very much more, all covered at a good gallop. Such achievements were possible only through the improvement in staying power of hounds brought about by careful breeding.

The old slow tactics, however, disappeared, and the fox was killed as much by pace as by the actual hunting of his line. Thus for many of the field, hunting became a matter of hard riding rather than of vengery.

Twentieth century hunting is something between the two. Less damage is done, and large "fields" out solely for the ride, many of them in no way connected with the land over which they ride, are not so usual. The establishment of aerodromes, the enclosure of land occupied by T.T. herds, more tillage, and an increase of wire everywhere, leave plenty of scope for foxhunting, but make the old hard riding impossible.

The nature of a hunt depends in general upon the character of the

country in which it takes place. A well-wooded country, with coverts close to one another, provides the best scope for hound work, whilst open land with some distance between coverts gives most chance of a good gallop. There are approximately 200 packs of hounds in Great Britain today recognized by the Master of Foxhounds association, which is the governing body, establishing boundaries, and laying down rules for the conduct of the chase. Only the master of a pack recognized by the association may place the initials M.F.H. after his name. The Quorn, Pytchley, Belvoir, Fernie's, and Cottesmore are usually known as "the Shires," and fall into the "open country" category, but many provincial packs come very near to the same description. Well known hunts famed for good hunting, and many of them covering both kinds of country, include The Duke of Beaufort's (a very large country centred round Badminton); the Warwickshire; the Bicester, Grafton, and Whaddon Chase in the home counties; the York and Ainsty (two packs); Cheshire; and Blackmore Vale in Dorset and Somerset.

Riding to hounds is only a part of the enjoyment to many who are interested in watching the work of hounds and huntsman in overcoming the wiles of probably the cleverest of all eluders. A good huntsman knows his country and has a very good idea of the probable line his hunted fox will take, where it is likely to be found initially, and how to keep with his hounds so as to be at hand should they require his assistance. He will also know when to leave them alone. His hounds are individuals to him and he appreciates and relies upon the individual quality of each. Some hounds are particularly expert on a cold and stale scent, some are distinguished by the determination with which they penetrate the thickest cover; some are "babblers," other only "speak" when they are sure. It is in watching the handling of this diverse team that the enthusiastic foxhunter gets a great deal of his pleasure.

The cost of hunting is met by those who hunt, by those who, while not hunting themselves, yet take an interest in and subscribe to, their local pack, and, in increasing numbers, by the farmers over whose land the hunt passes. Farmers are in general staunch

foxhunters, assisting hunt establishments in kind (in the form of forage for hunt horses or dead stock for hounds) as well as with subscriptions, and getting wire taken down wherever possible during the hunting season. Indeed, the survival of the fox depends upon the good will towards the chase of the rural population in general.

The Master of a pack of hounds undertakes to hunt the country so many days a week with a certain subscription, making up the balance as may be required himself. Prior to 1939 the cost of hunting a country was estimated at £1,000 per annum for each day in the week hunted, i.e. a four days a week country cost £4,000 a year. When hunting was renewed at the end of the Second Great War costs had risen by at least 50 p.c. Control of a country by a committee has tided many packs over emergencies such as inability to find a Master. Committees are, however, never more than stop-gaps; individual leadership is essential to the well-being of a country. The money provided is spent on wages for the huntsman (unless the Master hunts hounds himself), one or two whippers-in, at least two more men in stables to ride "2nd horse" at meet, a stud groom, kennel man, one or two feeders (according to the number of hounds kept in kennel, anything from 20-75 couple), and payment to earth stoppers, those who seal up the fox-earths in the night whilst the foxes are out, so that the hunted fox shall not find refuge underground if it can be prevented—an onerous task if properly performed. Oatmeal and flesh for hounds, and fodder for hunt horses, have to be found; compensation claims for damaged fences or the loss of poultry taken by foxes have to be met. Hunt servants' livery is another item, and saddlery for hunt horses.

Foxhunting encourages the breeding of the English hunter—a type of horse eagerly sought after all over the world. Hound-breeding is almost an industry, and the British foxhound is perhaps the greatest triumph of dog-breeding in the world. Evolved from a deer-hunting dog, the foxhound will hunt deer, fox, hare, or otter according to training. There are many breeds of hound hunting by scent in Europe and America, but the English type leads them all and is always saleable abroad.

Lionel Dawson

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1920; Hunting the Fox, Lord Willoughby de Broke, 1920; Wild Lone, "B.B.," 1938.

**Fox Islands.** Variant name given to the Aleutian Islands (*q.v.*). It is more specifically confined to the extreme E. group, consisting of Unalaska, Unimak, Umnak, and a number of smaller islands.

**Fox Land.** Desolate region in the S.W. of Baffin Island, British N. America. It lies between Fox Channel on the N.W. and Hudson Strait on the S.E.

**Foxtail.** Means of preventing a bar of wood or metal bolt from being withdrawn from a hole. The entering end is split, the point of a wedge is inserted, and the bar is driven home, the wedge expanding the material against the sides of the hole.

**Foxtail Grass** (*Alopecurus pratensis*). Perennial grass of the family Gramineae. It is a native of Europe, N. Africa, and Asia. It sends out runners from the roots, and has flowering stems 1 ft. to 3 ft. high. The leaves are rough and flat; the flowers form a soft, cylindric panicle. It is a most valuable meadow-grass, and of high nutritive value.

**Fox Terrier.** Small breed of terrier, of two types, the smooth-haired and the wire-haired or rough-coated. The smooth-haired is used in the hunt for unearthing



Fox Terrier. Prizewinning dog of the rough coated variety

foxes and the rough-haired for rattling. Either is a popular domestic pet on account of its intelligence, friendly disposition, and readiness to obey orders. To judge from show records, the smooth-haired fox terrier came into favour earlier than the rough-coated, though the latter is the better hunter. In everything except coat, the two varieties are identical. In colour the fox terrier should be black, white, and tan; specimens that show liver-coloured markings should be avoided for show and breeding purposes. See Dog and illus. on colour plate.

**Foxtrot.** Dance of American origin from negro sources. As a comparatively simple social dance for two partners, based on an adaptation of the march step to ragtime rhythm, it rapidly became popular in every part of the world from 1914, replacing the waltz as the most frequent item in "ballroom" dance programmes. Later it became more of a generic term for a style of dance than the name of any particular sequence of movements. Foxtrots may be either fast (quickstep) or slow (approximating to the Blues), simple or complex. See Dancing, Ballroom.

**Foy, MAXIMILIEN SÉBASTIEN** (1775-1825). French soldier. Entering the army in 1791, he first saw service under Dumouriez. Distinguishing himself in Italy, 1801, and in the Austrian campaign, 1805, he was sent by Napoleon in 1807 with a small force to



Maximilien Foy, French soldier

the sultan against the Russians and British. In 1808 he was in Spain, and fought in the Peninsular War, being made a divisional general in 1810. He held a command at Waterloo. After 1815 he made his peace with the new regime and sat in the French chamber. He died in Paris, Nov. 28, 1825. His History of the Peninsular War was published in 1827.

**Foyers.** Two cascades (40 ft. and 165 ft.) near the mouth of the Foyers river, on the E. side of Loch Ness, Inverness-shire, Scotland. Since 1895 they have been used by the British Aluminium Company for generating electricity.

**Foyle.** Lough or inlet between co. Donegal, Eire, and co. Londonderry, N. Ireland, into which drains the river Foyle, 16 m. long. It is 18 m. long and has a width of 1 m. at the entrance, and an extreme width of 10 m. Dangerous shoals obstruct navigation on the W. side.

**Foynes.** Village of co. Limerick, Eire, 24 m. W. of Limerick, at the estuary of the Shannon. Here was established the first eastern base, for flying boats only, for trans-Atlantic flights. It came into use in 1937, first for trials and later for regular services, by British and U.S. aircraft. It afterwards became part of the Shannon airport (*q.v.*) with Rineanna, 8 m. distant, the main landplane terminal.





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